THE Journal

MAY

1956

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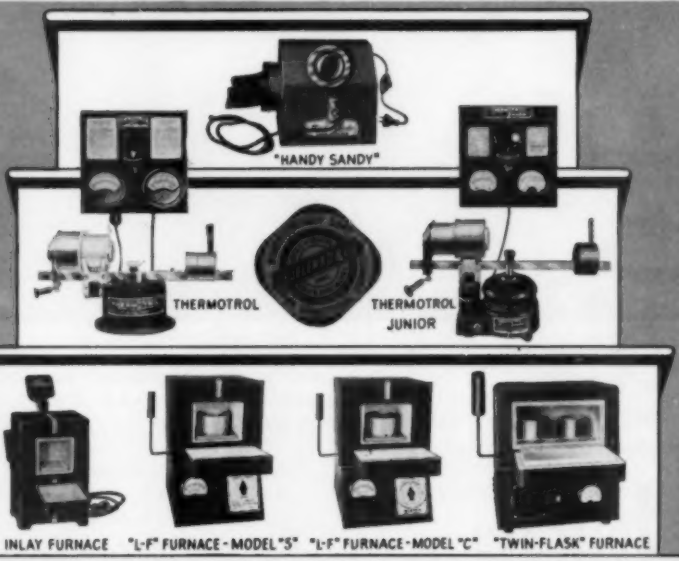

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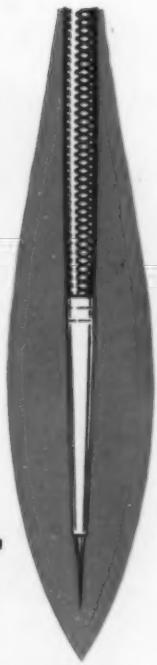

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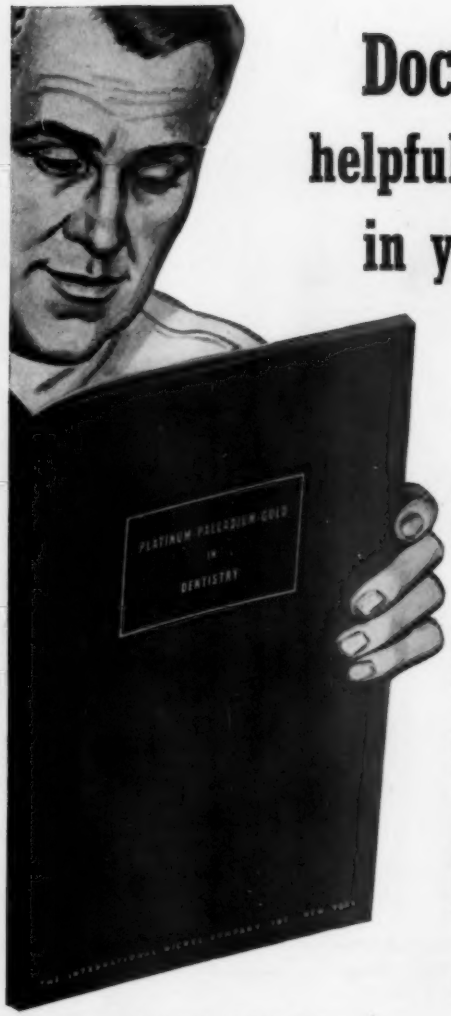

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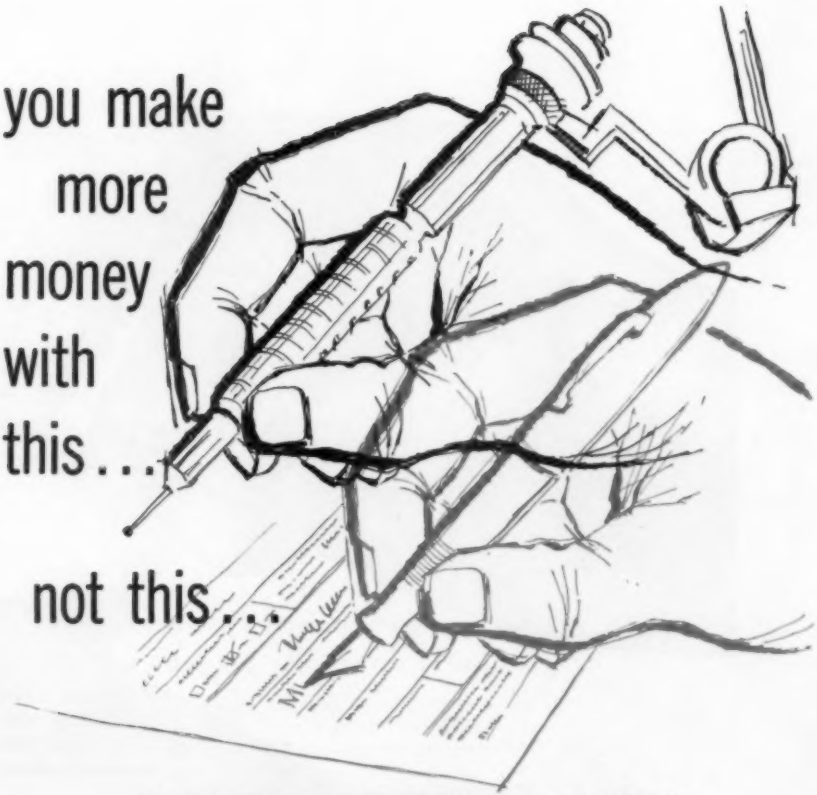

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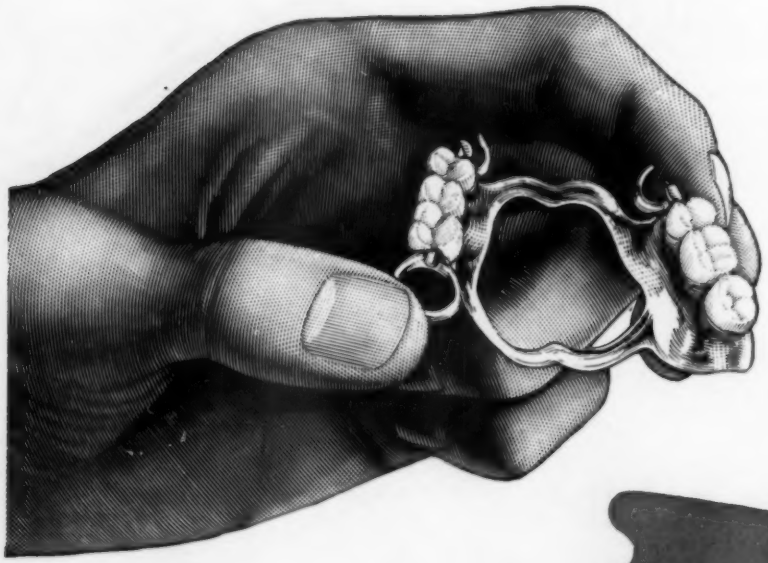

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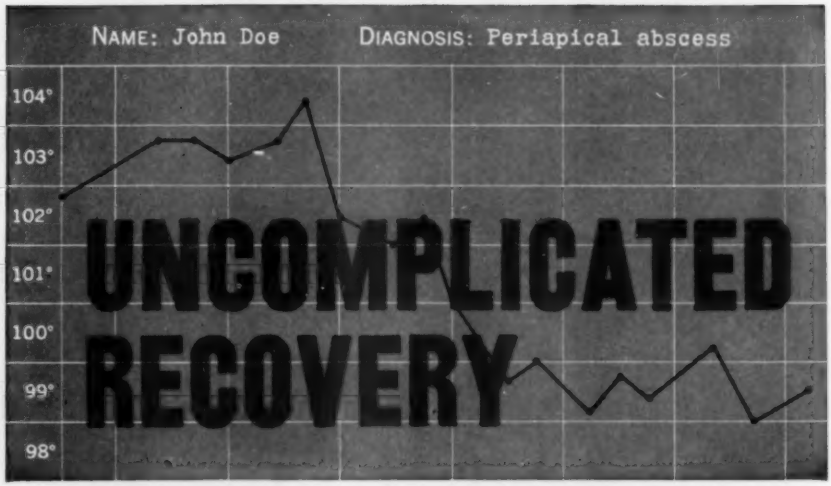

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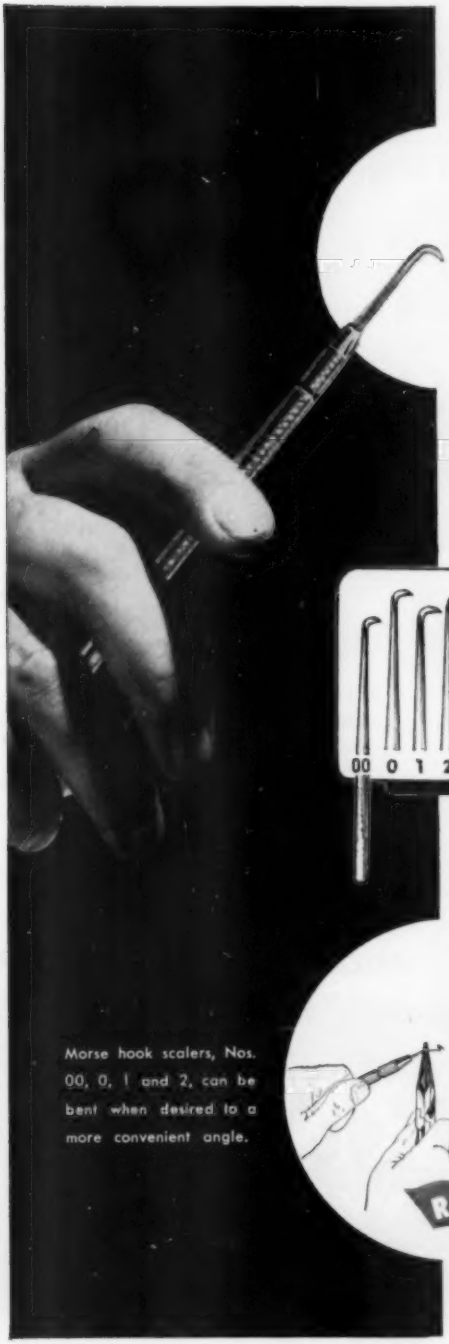

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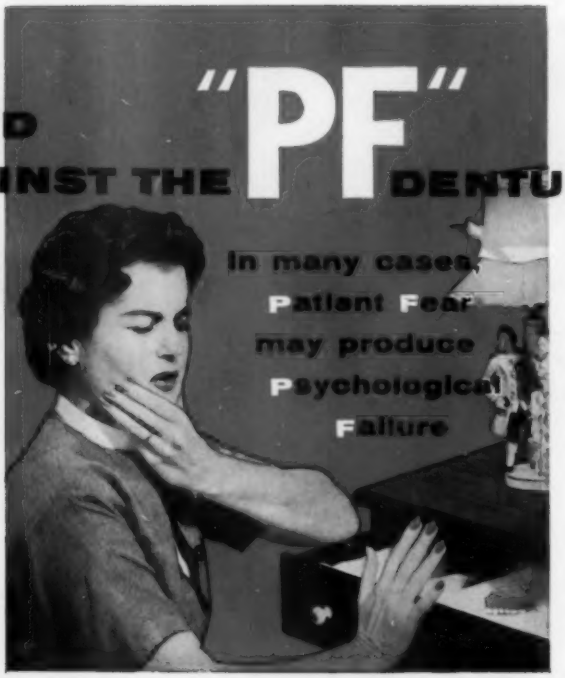

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It may seem odd to have been so long in coming; but it was not until 1766 that the so-called "calendar of dentition" was clearly developed. In that year, Carl A. Grabner first diagrammed the time and order of eruption of the deciduous and permanent teeth, in his "Gedanken über das Hervorkommen und Wechsein der Zähne bei Kindern". • • •

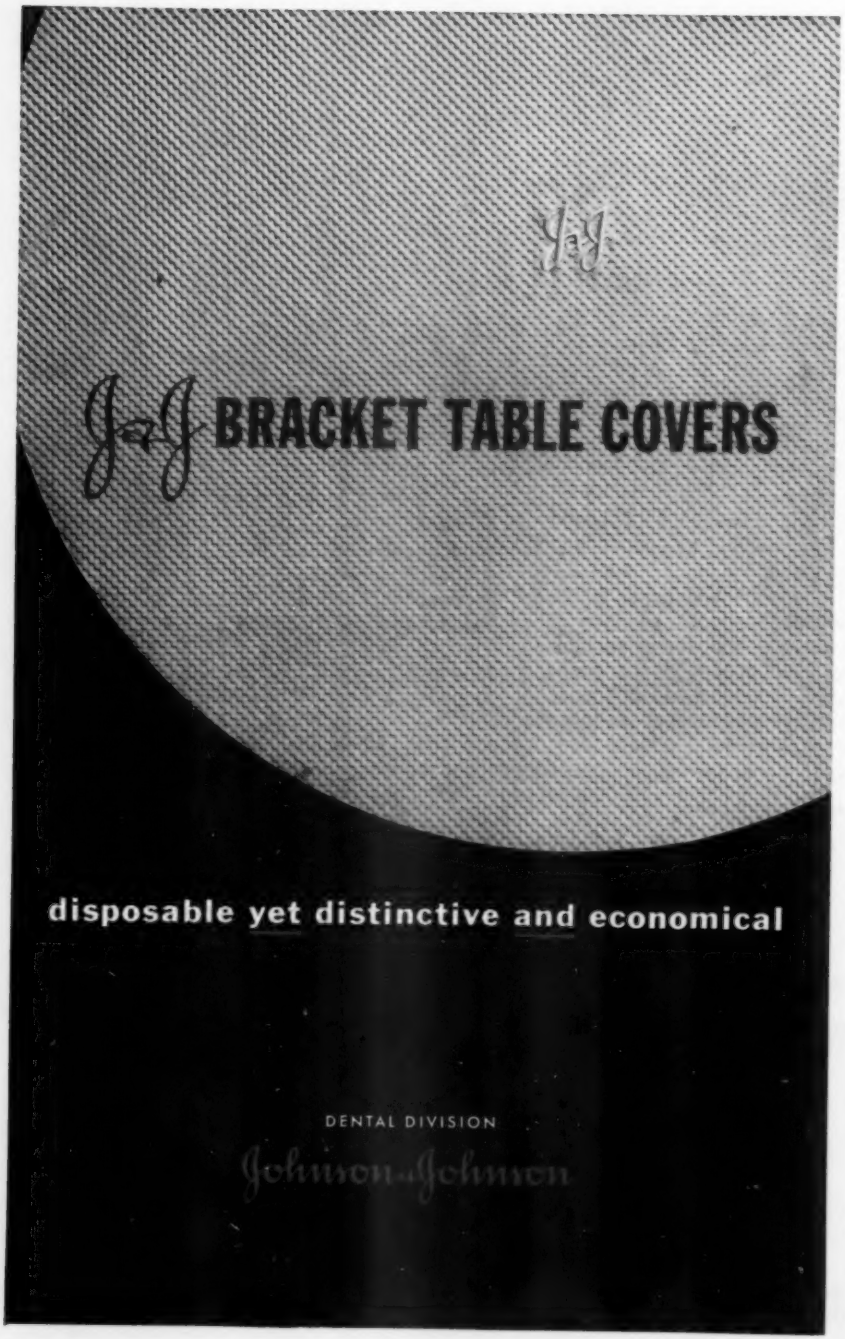
For centuries, Japanese women often blackened their teeth, generally to indicate their married status. This practice has now fallen into disuse; but until fairly recently the list of exports from the U.S. to Japan included black porcelain teeth for married women's dentures! • • •

To primitive peoples, an enemy's tooth often represented the enemy himself. One of the most valued possessions of King Si Gallak of Sumatra was a bamboo box which had the tooth of one of his royal cannibalized enemies mounted in its lid. When he beat the tooth he felt that he was beating his dead enemy. At length, however, the tables were turned, and presently the enemy's new king had a bamboo box with a tooth — Si Gallak's — in its lid. Sic transit . . . • • •

What does a writer on dental problems do for relaxation? One interesting answer is found in Dr. Rodrigues Ottolengui, who served with distinction as editor of "Dental Items of Interest" from 1896 to the time of his death in 1937. In his spare time he authored a number of detective novels of outstanding merit.

• • •

An impressive manifestation of present-day India's participation in important scientific research is the large, ultra-modern building of the National Physical Laboratory in Delhi. This represents only one of the many phases of pure and applied research which have resulted, for example, in the refining of Gum karaya — the exudate of the Indian gum tree — into a form that serves so excellently as the basic ingredient of Wernet's Powder.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Reaction of odontoblasts to medicaments placed in cavity preparations in rat incisors

J. Georges Perreault, D.D.S., M.S., Montreal, Quebec, Canada; Maury Massler,† D.D.S., M.S., and Isaac Schour,‡ D.D.S., Ph.D., Chicago*

A variety of medicaments are used in the practice of dentistry to sterilize the dentin prior to the insertion of the filling material. The use of these agents is predicated on the fact that the dentinal tubules in advance of the carious lesion often contain microorganisms derived from the lesion.[1,2] It is impossible to remove all of the softened and discolored dentin under the active carious lesion in a very deep cavity without injuring the pulp or without entering into the pulp itself. Most clinicians, therefore, advocate the removal of the grossly infected and necrotic dentin and attempt to sterilize the underlying discolored and slightly softened dentin. This phase of the problem has been reviewed by Hardwick,[3] Day,[4] Stephan, Muntz and Dorfman,[5] Seltzer,[6,7] and Barker.[8]

Phenol, phenol compounds, phenol derivatives, alcohol and silver nitrate are the agents commonly employed to sterilize dentin. Although the efficacy of these agents is often disputed, the use of sterilizing agents prior to insertion of

Prize-winning essay presented before the Midwinter Meeting of the Chicago Dental Society, February 7, 1956.

*Faculty of Dental Surgery, University of Montreal.

†Professor and head of department of pedodontics, University of Illinois College of Dentistry.

‡Dean, University of Illinois College of Dentistry.

1. Black, G. V. Operative dentistry. Vol. I: Pathology of hard tissues of the teeth. Chicago, Medico-Dental Pub. Co., 1924, p. 70.

2. Kronfeld, R. Histopathology of the teeth and their surrounding structures, ed. 3. Boyle, P. E., editor. Philadelphia, Lea & Febiger, 1949, p. 144.

3. Hardwick, J. L. Sterilization of carious dentin. Proc. Roy. Soc. Med. 42:815 Oct. 1949.

4. Day, H. W. Thymol in cavity sterilization. J.A.D.A. 31:605 May 1944.

5. Muntz, J. A.; Dorfman, A., and Stephan, R. N. In vitro studies on sterilization of carious dentin. I. Evaluation of germicides J.A.D.A. 30:1893; II. Extent of infection in carious lesions: 30:1901; III. Effective penetration of germicides into carious lesions. 30:1905 Dec. 1, 1943.

6. Seltzer, S. Comparative value of various medicaments in cavity sterilization. J.A.D.A. 28:1844 Nov. 1941.

7. Seltzer, S. Effectiveness of antibacterial agents used in cavity sterilization. J. D. Res. 21:269 June 1942.

8. Barker, J. N. Sterilization of dentin. Austral. J. Den. 39:156 May 1935.

a filling is widely employed on the assumption that, although these medicaments may not completely sterilize the dentin, they are helpful and will do no harm to the pulp. The latter supposition, however, may be false. It was the primary purpose of the investigation herein described to determine the effect of a number of commonly used medicaments on the dental pulp by applying these agents and others, under controlled conditions, to cavities prepared in the incisor of albino rats, and then studying the effect on the pulp histologically.

The effect of two fluoride salts and three chemical agents commonly used in filling materials (orthophosphoric acid, acrylic monomer and chloroform) also was studied. The fluoride salts were included in this study because they are frequently applied topically on the teeth of children to inhibit attack by caries, and because a few studies have indicated that the fluorides are injurious to the dental pulp. Orthophosphoric acid and acrylic monomer were studied because the fillings in which they are employed (zinc phosphate cement, silicates and self-curing acrylic resins) have been shown to be injurious to the pulp.[9] It was felt that it would be important to determine whether these particular materials were the noxious agents in the respective fillings.

In addition, chloroform was tested since it is commonly employed as the solvent in temporary filling materials and in cavity liners.

REVIEW OF LITERATURE

As far as can be determined from a careful review of the literature, there has not been any systematic histologic study on a comparative basis under rigidly controlled conditions of the effect on the dental pulp of the various drugs and chemical agents commonly used in dentistry. There have been a few histologic studies on human teeth of the effect on the pulp of silver nitrate[3, 8, 10, 11] phenol[12, 13] and sodium fluoride.[14-16]

The histologic effect of the germicides on the pulp usually are reported incidentally while reporting the major study of the bacteriologic (germicidal) action of these agents. Hardwick[3] states that "30 germicides were studied histologically" but confines the report of his histologic findings to two paragraphs on the effect of silver nitrate on the pulp. This is in contrast to the comprehensive attempts made to evaluate the effect of various filling materials on the pulp.[9]

In general, the histologic reports dealing with the effect of various germicides, including phenol and silver nitrate, indicate no severe injury to the dental pulp of human teeth.[3] The effect of sodium fluoride appears to be more severe, but even these agents do not cause remarkable or severe reactions in the pulp, apparently, except when sealed in cavities for long periods of time.[16]

It is very difficult to decide from these studies the absolute or relative effects on the pulp of silver nitrate, phenol or sodium fluoride, since each investigator employed the materials under different conditions and used different criteria of assessment. It is hoped that the present study will provide a reliable and stand-

9. Silberkweit, M. Reaction of odontoblasts to filling materials placed in incisors of albino rats. Master's thesis, University of Illinois College of Dentistry, 1954.

10. Zander, H., and Burrill, D. Y. Penetration of silver nitrate solution into dentin. J. D. Res. 22:85 April 1943.

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12. Thomas, B. O. A. Penetration of phenol in tooth structure. J. D. Res. 20:435 Oct. 1941.

13. Kramer, I. R. H., and McLean, J. W. Response of human pulp to self-polymerizing acrylic restorations. Brit. D. J. 92:281 June 3, 1952.

14. Lefkowitz, W., and Bodecker, C. F. Sodium fluoride: its effects on the dental pulp. Ann. Den. 3:141 March 1945.

15. Rovelstad, G. H., and St. John, W. E. Condition of the young dental pulp after the application of sodium fluoride to freshly cut dentin. J.A.D.A. 39:670 Dec. 1949.

16. Maurice, C. G. Pulpal response to sodium fluoride in experimental dentinal cavities in the rat molar. Master's thesis, University of Illinois College of Dentistry, 1953.

ardized method whereby the biological assessment of the effect of different drugs and chemical agents on the pulp can be made under controlled conditions.

The use of human teeth for the purpose of studying the effect of sterilizing agents on the pulp has many drawbacks. First, such teeth can be obtained only in limited numbers. Moreover, human teeth present a wide variety of pulpal conditions and reactions because of age as well as previous injury by caries and operative procedures; therefore, the effect of any one medicament or filling material presents a confusing picture which is difficult to assess accurately.

In 1952, Schour[17] suggested the use of the rat incisor as a test object for the study of the effect of filling materials and drugs on the pulp. The rat has many advantages over the dog or monkey for this purpose, the most important being the extremely rapid rate of growth of the incisor so that the effect on the pulp can be visualized easily and objectively measured in a relatively short period of time—in one week instead of one month or a year.[9]

Mohammed and Schour[18, 19] developed a standardized technic of cavity preparation for the rat incisor. In 1954, Silberkweit[9] employed the same procedure to assess the effect of filling materials on the odontoblasts and pulp of the rat incisor. During this study, she outlined the criteria for the assessment of the effect on the pulp. The same procedures and essentially the same criteria were used in this investigation.

TECHNICAL PROCEDURES

Operative Procedure • The rats were anesthetized by an intraperitoneal injection of 0.5 cc. of 1 per cent pentobarbital sodium per 150 to 200 Gm. of body weight. A cavity was then prepared, with the aid of a binocular dissecting microscope at a magnification of 27X, on the lateral aspect of the left mandibular incisor just anterior to the lower first molar and inferior to the mental foramen.

Cavity Preparation • The left side of the lower lip of the rat was retracted, and an intraoral incision was made in the vicinity of the mental foramen using a no. 11 Bard-Parker blade. Care was taken not to injure the mental nerve. Hemorrhage was controlled by a topical application of epinephrine 1:1,000.

A cavity approximately 2 mm. in diameter was first cut into the bone with a no. 703 bur until the dentin of the lateral aspect of the incisor was exposed to view. The hemorrhage from the periodontal membrane was controlled with cotton pellets and air.

A cavity approximately 0.75 mm. in diameter was then cut into the dentin, 0.055 mm. to 0.085 mm. from the pulp, using a no. 33½ inverted cone bur revolving at a speed of about 800 rpm. Details of this operative procedure are described by Silberkweit[9] and Mohammed and Schour.[18]

Application of Medicaments • After the cavity was completed, it was washed with distilled water and dried. A tiny pellet of cotton saturated with a medicament was then placed in the cavity for timed periods of one or ten minutes.

After the specified time had elapsed, the cavity was gently dried with air and filled with a substance (zinc oxide, 2 parts, zinc sulfate, 1 part, corn starch, 1 part, mixed with water to form a paste), which Orban has termed "aquadont." A thin layer of paraffin wax was melted over the cavity filling and an additional quantity of aquadont was used to fill the bone cavity. The layer of wax between

17. Schour, I. Personal communication, 1952.

18. Mohammed, C. I., and Schour, I. Experimental cavity preparations in the incisor of the rat. J. D. Res. 34:608 Aug. 1955.

19. Mohammed, C. I. The rat incisor as an indicator for the response of the dentin and pulp to injury: the reaction to paraformaldehyde. Master's thesis, University of Illinois College of Dentistry, 1952.

the dentin filling and the one in the bone was necessary to insure a good seal and to prevent ankylosis of the tooth to the bone.

In 18 specimens, the medicaments were sealed in the cavity for a period of two to three days. Chromatographic paper was saturated with the medicament, placed in the cavity and sealed in with paraffin. The bone cavity was then filled with aquadont.

The entire operation lasted approximately 40 minutes.

The medicaments used were: acrylic monomer; orthophosphoric acid; alcohol 95 per cent; chloroform; hydrogen peroxide 4 per cent; benzalkonium chloride 1:1,000; sodium fluoride 4 per cent aqueous solution; sodium silicofluoride 0.9 per cent aqueous solution; phenol; phenol compound (Buckley); beechwood creosote; eugenol; thymol; eucalyptol; silver nitrate (saturated solution); and ammoniacal silver nitrate (Howe's).

Each medicament was tested in the teeth of at least three different animals. Many were used in 7 to 10 animals.

Controls • Three groups of controls were employed. In ten animals, aquadont fillings were placed without previous medication of the cavity. These animals constituted the positive control group.

In addition, zinc-oxide-eugenol cement was placed in the dentinal cavities of ten animals (without previous medication) since this material is commonly used in dental practice and has been shown to be palliative to the pulp.[9]

In eight animals, the cavities were left unfilled. These three groups constituted a check series of different controls whereby the effects of the cavity preparations on the unmedicated pulp could be accurately assessed.

Duration of Experiments • The animals were sacrificed after two or three days or after seven or eight days by ether and decapitation. The survival period was limited to eight days since the incisor is a continuously erupting tooth. After eight days the operated portion of the dentin and the pulp begins to show age changes so that the experimental effect becomes obscure.

Histologic Preparation • Immediately after sacrifice, the mandibles were dissected and fixed in 10 per cent neutral Formalin. The specimens were decalcified in 5 per cent nitric acid for three days, and histologic sections cut on a freezing microtome at 22 microns using carbon dioxide gas. All sections were stained with hematoxylin and eosin.

MATERIAL

Two hundred and six animals were used for this investigation. All were male albino rats 50 to 60 days of age and weighed from 150 to 175 Gm. They were fed Purina chow checkers ad libidum.

METHODS OF ANALYSIS

The effect of the drugs on the dental pulp was not assessed directly by analysis of the cytologic changes in the cells of the pulp, but was assessed indirectly by analysis of the character and amount of dentin produced by the odontoblasts. The reason for this procedure was that the histologic description of morphologic changes in the pulpal cells does not describe changes in the physiology and function of these cells adequately, whereas the character and amount of dentin is a very delicate indicator of the physiology of the odontoblasts, often revealing alterations in cell function long before morphologic changes in the cells can be discerned.

The Calcio-Traumatic Band • The immediate effect of the operative procedure and filling was the formation of a distinct calcio-traumatic band which reflected a disturbance in the calcification

of the predentin formed at the time of operation (Fig. 1). This formation consists of a very thin, barely discernible hypercalcified (deep blue) line followed by a wider hypocalcified stripe (light pink) and a hypercalcified (blue) stripe.[20]

In almost every instance, the acute calcio-traumatic effect was prominent, and the band stood out clearly between the pre-experimental and postoperative region of dentin formation. When there was doubt, the calcio-traumatic band could be located easily by counting the number of daily incremental lines formed postoperatively.

Postoperative Dentin Calcification and Formation • The postoperative dentin varied from a perfectly normal structure and calcification (indicating complete recovery of the odontoblasts) to various degrees of disturbance in calcification (accentuated stratification of postoperative dentin) and interferences in the deposition of dentin matrix (dentin hypoplasia or aplasia) reflecting various degrees of postoperative injury to the odontoblasts (Fig. 2).

The dentin formed and calcified after the operative procedure, and placement of the filling was analyzed, therefore, in terms of its quality (degree of calcification and structure) and its quantity (amount formed).

Degree of Calcification • The degree of calcification was determined by the number and prominence of the incremental lines formed in the postoperative dentin; the more prominent the stratification, the more severe the disturbance.

Slight accentuations of the incremental pattern often are found in normal animals and reflect the extreme delicacy of the calcification of the dentin to even slight variations in metabolic functions (Fig. 3, left).

A moderate disturbance of odontoblastic function which continues beyond the time of the operation throughout the period of postoperative dentin calcification is evidenced as a prominent accentuation of the incremental pattern to produce a characteristic stratification of the postoperative dentin (Fig. 3, right, and Fig. 4, left).

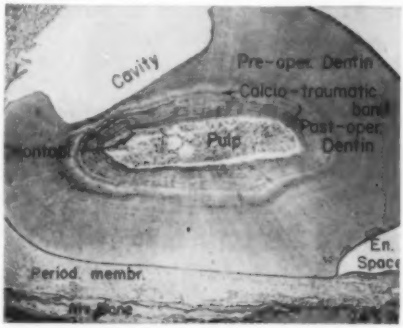

Fig 1 • Cross-section through rat incisor showing cavity preparation (medium depth), the calcio-traumatic band and areas of preoperative and postoperative dentin formation. This cavity was filled with zinc-oxide-eugenol without prior medication. Note that calcio-traumatic band completely encircles the pulp. The calcio-traumatic reaction was judged to be normal under shallow portion of cavity and slightly accentuated (1) under deep portion. Postoperative dentin was judged to be normal (N) under shallow portion of cavity preparation but the incremental lines are more prominent (1) under deep portion

A more severe disturbance in calcification produces an incomplete fusion of the calcospherites in the matrix proper. This disturbance is evidenced as a granular or interglobular appearance of the dentin matrix.

Structure of Dentin • More severe effects on the odontoblasts are reflected as a disturbance in the normal tubular structure of the dentin. The tubuli may be

20. Irving, J. T., and Weinmann, J. P. Experimental studies in calcification. VI. Response of dentin of the rat incisor to injections of strontium. J. D. Res. 27:669 Dec. 1948.

interrupted, be decreased in number or completely absent (Fig. 4, right).

Amount of Postoperative Dentin • More severe injury to the odontoblasts resulted in a slow or delayed recovery of these cells with the formation of hypoplastic defects in the postoperative dentin. If the cells were destroyed by the medicament applied at the time of operation, aplasia resulted (complete absence of postoperative dentin formation).

The amount of dentin formed after the operation was measured from the acute calcio-traumatic band formed at the time of operation to the pulpal surface. These measurements were made under the region of the cavity preparation along the dentinal tubuli and were compared with the amount of dentin formed on the side opposite the cavity preparation.

Pulpal Changes • Most of the medicaments studied affected only the odontoblasts through the medium of the freshly cut protoplasmic processes. The pulpal tissue and pulpal cells underlying the odontoblastic layer were unaffected. These agents were designated as very mild, mild or moderate according to the effect on the odontoblastic functions.

Certain agents penetrated through the dentin and past the odontoblastic layer and affected the underlying pulp as well. In such specimens, the odontoblasts outside the region of the cavity preparation also were affected as evidenced by hypoplastic and aplastic defects in the postoperative dentin outside the cavity region. Pulpal hemorrhages and cellular changes also were present. Such agents as orthophosphoric acid were designated, therefore, as producing a severe reaction and were considered to be injurious to the pulp since recovery of the odontoblasts from these injuries was unlikely. Silver nitrate produced severe and extensive pulpal injury in the form of hemorrhage and abscesses in the pulp. This injury was designated as destructive since, under these conditions, recovery of the pulpal cells was virtually impossible.

CRITERIA USED FOR ANALYSIS

The following criteria were used to analyze the effect of the filling materials on the function of the odontoblasts:

Acute Calcio-Traumatic Reaction

(Tables 1 and 2 column 4; Table 2 column 3)

(Reaction of odontoblasts at time of operation)

N. A slight accentuation of the incremental line formed at the time of operation (calcio-traumatic band), completely surrounding the pulp. The calcio-traumatic reaction caused by operation consists of anesthesia and the animals' temporary failure to eat. The hypercalcified stripe usually is more prominent than the hypocalcified stripe. The character of the line formed under the cavity is the same as that on the opposite side, indicating no additional injury to the odontoblasts by the cavity preparation and application of the drug or filling.

1. The calcio-traumatic band under the cavity is slightly more prominent than in other portions of circumpulpar dentin which indicates a mild irritant effect on the odontoblasts by cavity preparation or drug. The hypocalcified stripe is more prominent than the hypercalcified stripe.

2. The calcio-traumatic band under the cavity is significantly more prominent than in other portions of the dentin. The hypocalcified stripe is wide and prominent which indicates a moderately acute reaction by the odontoblasts to the irritant (drug or cavity preparation), with recovery thereafter.

3. A very wide hypocalcified calcio-traumatic band which represents a longer arrest in calcification of the dentin and indicates a moderately severe reaction of the odontoblasts.

4. The dentinal tubules are interrupted in their course at time of operation. This condition usually is accompanied by formation of a wide hypocalcified band as under 2. It represents a severe acute injury to the odontoblasts.

Postoperative Reaction

The postoperative reaction indicates the degree of recovery of the odontoblasts. It is judged by the calcification and structure of the dentin formed postoperatively as well as by the amount formed.

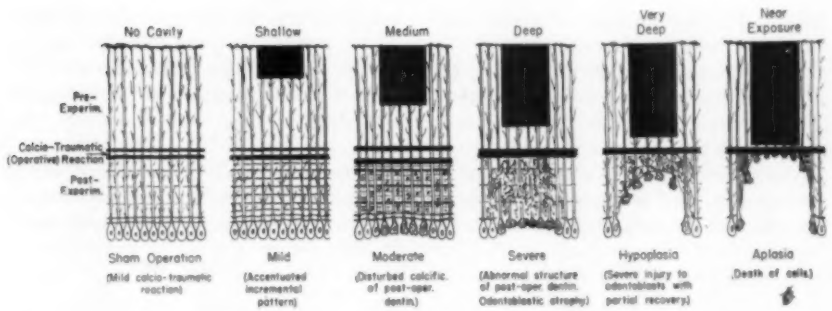

Fig. 2 • Drawing showing effects of cavity depth on odontoblasts as evidenced by acute calcio-traumatic reaction formed at the time of operation, and in the quality of the post-operative dentin formed by these cells

Quality of Postoperative Dentin

(Tables 1 and 2, column 5; Table 2, column 4)

N. The incremental pattern of the dentin formed postoperatively usually was slightly more prominent than the preoperative dentin as a result of the operation *per se*. N indicates the fact that the calcification, structure and amount of dentin formed under the cavity preparation was the same as the dentin formed on the opposite side and in the right, unoperated control tooth.

Disturbances in Calcification

1. Definite disturbance in the postoperative calcification of the dentin under the cavity as compared to rest of dentin. This disturbance is characterized by an accentuation of the incremental pattern in the dentin under the cavity preparation.

2. Moderately severe disturbance in the calcification including interglobular calcification of the dentin under the cavity. This condition indicates a slow recovery by the odontoblasts from the acute injury caused by the operation and application of the drug.

Disturbances in Structure

3. The tubules in the dentin are reduced in number.

4. The dentin matrix is without tubules and is homogenous and fibrillar. It stains deep blue with hematoxylin and eosin which indicates poor postoperative recovery by the odontoblasts. The dentin usually is hypoplastic.

Quantity of Postoperative Dentin

N. The amount of dentin formed under the cavity is normal when compared with the amount formed on the opposite side of the teeth or in an unoperated control tooth.

Hypoplasia. The postoperative dentin formation is deficient in amount which indicates severe injury to odontoblasts under the cavity preparation with partial recovery of the cells. Small hypoplastic defect: only a few cells affected. Moderate hypoplasia: less than half of the cells affected. Severe hypoplasia: almost all cells affected.

Aplasia. Complete lack of postoperative dentin formation under the cavity preparation, indicating death of all odontoblasts in that region.

FINDINGS

The results are summarized in Tables 1 and 2. The materials are listed in the order of increasingly injurious effects on the functions of the odontoblasts and the pulp.

The effects are presented in terms of (1) the acute effect on the odontoblasts as reflected in the character of the calcio-traumatic reaction, and (2) the recovery of these cells as seen in the quality and quantity of the dentin produced by these cells during the postoperative period (seven days). In the case of injurious or destructive agents, the effect on the pulp itself was also analyzed. Since the effect became more severe as the cavity became deeper, the effect of each substance was analyzed at different cavity depths.

Effect of Operative Procedures and Filling with Palliative Materials • Table 1, Group A, and Figure 3 indicate the effects of the operative procedure *per se*. The cavities in this series were filled with a palliative filling material (aquadont or zinc-oxide-eugenol) or were allowed to remain open and become filled by an ingrowth of connective tissue without being subjected to the action of any drug. These specimens constitute the control groups against which the effects of the various chemical agents or medicaments were assessed.

Effect of Cavity Depth • The effect of the operative procedure became more injurious as the floor of the cavity came

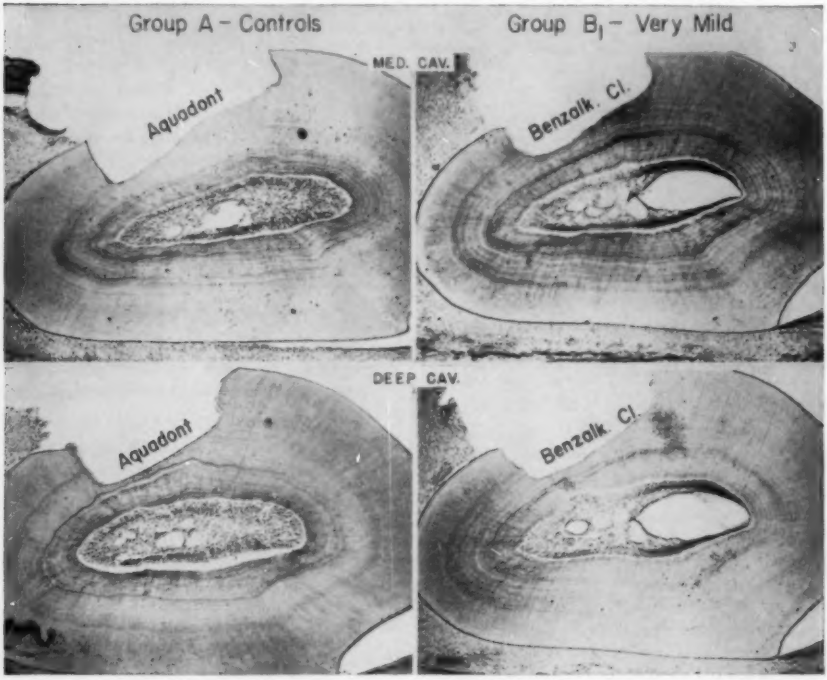

Fig. 3 • Controls. Cavities filled with aquadont without prior medication. Above left: Medium cavity depth (52 microns from pulp). Note that calcio-traumatic reaction and preparation are normal (N) which indicates that at this distance the cavity preparation had no effect on odontoblasts. Below left: Deep cavity (19 microns from the pulp). Note effects of deeper cavity preparation on odontoblasts. The calcio-traumatic reaction is definitely accentuated (1) under the cavity area but postoperative dentin is normal (N). Right: Effect of very mild agent on odontoblasts. Benzalkonium chloride 1:1,000 was applied to cavity for ten minutes prior to filling with aquadont. All animals in this series were sacrificed after seven days. Above right: Medium cavity depth (60 microns from pulp). Note slight accentuation of calcio-traumatic band (1) under cavity preparation, as compared with Figure 3, above left. Postoperative dentin is normal (N). Below right: Deep cavity (20 microns from the pulp). Note accentuated calcio-traumatic reaction (1) and small hypoplastic defect in the postoperative dentin. Hypoplasia is indicative of severe injury to a few odontoblasts with incomplete recovery by these cells. Compare with Figure 3, below left

closer to the odontoblastic layer and the pulp.

In the control series, cavities which were more than 90 microns from the pulp resulted in no demonstrable injury to the odontoblasts. The character of the calcio-traumatic reaction and the quality of the postoperative dentin formed under the cavity were in no way different from the unoperated portions of the dentin (Table 1 and Fig. 2).

In cavities which were 60 to 85 microns from the pulp, the calcio-traumatic reaction under the cavities was sometimes slightly accentuated (N to 1) while the postoperative dentin was normal (N), indicating a very slight and transitory injury to the odontoblasts under the cavity.

In cavities 30 to 55 microns from the pulp, the calcio-traumatic reaction was almost invariably mildly accentuated (1).

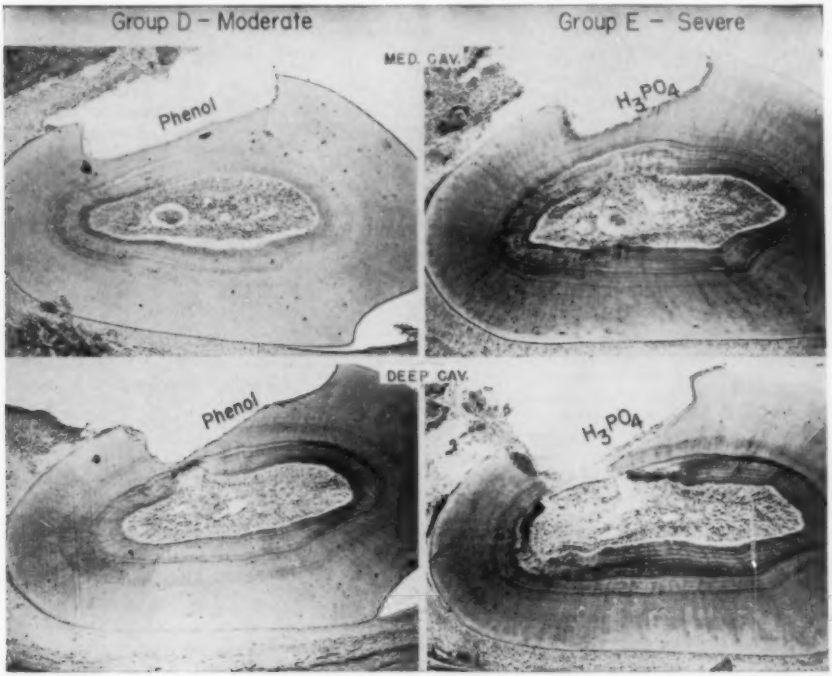

Fig. 4 • Moderate effect on odontoblasts produced by application of liquid phenol (Group D) for 10 minutes. Above left: Medium cavity depth (50 microns from pulp). Note severe calcio-traumatic reaction (3) under cavity preparation and normal postoperative dentin. Below left: Deep cavity (16 microns from pulp). Note larger area of hypoplasia under cavity. Pulp tissue under odontoblasts is normal and unaffected by phenol in spite of deep cavity preparation. Compare with Figure 4, below right. Right: Severe effect following application of orthophosphoric acid for 10 minutes. Above: Medium cavity depth (55 microns from the pulp). Note severe calcio-traumatic reaction and hypoplasia at this cavity depth. Below: Deep cavity (25 microns from pulp). Note decalcification of portion of pulpal floor of cavity and severe inflammatory reaction of pulp. Note also aplasia (under cavity) and hypoplasia to left of cavity

Table 1 • Summary of effects of medicaments on the odontoblasts and pulp of rat incisors
All drugs applied for 10 minutes. Survival—7 days

No. of animals	Procedure	Cavity depth*	Acute† calcio-traum. reaction	Postoper. calcif. & structure	Summary of effects on odontoblastic functions
10	Aquadont filling	Shallow	N	N	Group A (Controls) (No medication)
		Medium	N-1	N	
		Deep	1	N	
		Very deep	Hypoplasia (small)		
10	Zinc-oxide eugenol filling	Shallow	N	N	Mild acute calcio-traumatic reaction in deep cavities, with complete recovery thereafter
		Medium	N-1	N	
		Deep	1	N	
		Very deep	Hypoplasia (small)		
8	Open cavity (filled with conn. tissue)	Shallow	N	N	
		Medium	N-1	N	
		Deep	1	N-1	
		Very deep	Hypoplasia (small)		
10	Benzalkonium chloride	Shallow	N	N	Group B (Very mild reaction)
		Medium	N	N	
		Deep	1	1	
		Very deep	Hypoplasia (moder.)		
3	Peroxide	Shallow	N	N	Mild acute calcio-traumatic reaction in deep cavities, with slight delay in recovery thereafter
		Medium			
		Deep	No specimens		
		Very deep			
9	Acrylic monomer	Shallow	N	N	
		Medium	N	N	
		Deep	1	1	
		Very deep	Hypoplasia (moder.)		
7	Chloroform	Shallow	N	N	
		Medium	1	1	
		Deep	1	1	
		Very deep	Hypoplasia (moder.)		
9	Beechwood creosote	Shallow	N	N	Slight accentuation of the calcio-traumatic reaction in medium cavities, in addition to above
		Medium	1	N	
		Deep	1	1	
		Very deep	Hypoplasia (moder.)		
7	Eucalyptol	Shallow	N	N	
		Medium	1	N	
		Deep	1	1	
		Very deep	Hypoplasia (moder.)		
9	Eugenol	Shallow	N	N	
		Medium	1	N	
		Deep	2	N	
		Very deep	Hypoplasia (small)		
10	Thymol	Shallow	N	N	
		Medium	1	N	
		Deep	1	2	
		Very deep	(No specimens)		

No. of animals	Procedure	Cavity depth*	Acute† calcio-traum. reaction	Postoper. calcif. & structure	Summary of effects on odontoblastic functions
9	Alcohol 95%	Shallow Medium Deep Very deep	N 1 2 (No specimens)	N N 1	Group C (Mild reaction) Moderate acute calcio-traumatic reaction in deep cavities with moderate delay in recovery. Increased extent of hypoplasia in very deep cavities
9	Sodium fluoride 4%	Shallow Medium Deep Very deep	N 1 2 Hypoplasia (moder.)	N N 1	
9	Sodium silico-fluoride 0.9%	Shallow Medium Deep Very deep	N 1 2 Hypo-and aplasia	N N 1	
9	Phenol compd.	Shallow Medium Deep Very deep	1 2 & 4 2 Hypoplasia (moder.)	N N N	Group D (Moderate reaction) Moderate to severe acute reaction in medium cavities. Complete or almost complete recovery thereafter. Severe injury to cells in very deep cavities
14	Phenol	Shallow Medium Deep Very deep	N 2 3-4 Hypo-and aplasia	N 1 1	
12	Ortho-phosphoric acid	Shallow Medium Deep Very deep	N-1 Hypoplasia (at 55 μ) Aplasia (at 25 μ) Destruction of pulp	N	Group E (Severe reaction) Aplasia in deep cavities. Pulpal abscess in very deep cavities
8	Silver nitrate not reduced	Shallow Medium Deep	N 3-4 Aplasia (at 40 μ)	N 2	Group F (Destructive reaction) Hypoplasia in even shallow cavities. Aplasia and pulpal necrosis in medium and deep cavities
5	Silver nitrate eugenol reduced	Shallow Medium Deep	(No specimens) Aplasia (at 65 μ) Aplasia		
4	Silver nitrate Formalin reduced	Shallow Medium Deep	(No specimens) Aplasia (at 85 μ) Aplasia		
9	Ammon. Silver nitrate not reduced	Shallow Medium Deep	Hypoplasia Hypo-and aplasia Aplasia (at 60 μ)		
4	Ammon. Silver nitrate eugenol reduced	Shallow Medium Deep	Hypoplasia Hypoplasia (No specimens)		
4	Ammon. Silver nitrate Formalin reduced	Shallow Medium Deep	(No specimens) (No specimens) Aplasia		

*Cavity depth (column 3): shallow—more than 90 microns from pulp; medium—55-85 microns from pulp; deep—25-50 microns from pulp; very deep—15-25 microns from pulp.

†For details explaining criteria and abbreviations used in columns 4 and 5, see under "Criteria Used for Analysis" in text.

The postoperative dentin was normal (N). This finding indicated a definite but mild injury to the odontoblasts at the time of cavity preparation with subsequent recovery at a critical calcio-traumatic level, approximately 50 microns from the odontoblast and the pulp (Fig. 3, left).

In cavities 15 to 25 microns from the pulp, the calcio-traumatic reaction was more prominent (2) and a few cells were invariably destroyed, as evidenced by small localized hypoplastic defects in the postoperative dentin. A critical hypoplastic level, therefore, existed at approximately 25 microns from the odontoblasts.

In view of the increasingly injurious effects in the deeper cavities, the effect of each material was assessed separately in shallow cavities (more than 90 microns from the pulp), medium cavities (60 to 85 microns from the pulp), deep cavities (30 to 55 microns from the pulp) and very deep (15 to 25 microns) (Table 1).

Group A—Controls (No Medication) • Table 1 indicates that shallow and medium cavities filled with aquadont or zinc-oxide-eugenol showed no differences in the calcio-traumatic reaction or in the postoperative dentin formed under the cavities when compared with the unoperated portions of the dentin. This lack of difference indicates that the odontoblasts suffered no injury under shallow or medium cavities filled with aquadont or zinc-oxide-eugenol (Fig. 3, above left).

Cavities which were left open became filled with a blood clot which organized and was replaced by vital connective tissue growing in from the periodontal membrane. Medium cavities filled with connective tissue showed a slightly more prominent calcio-traumatic reaction than did those filled with aquadont or zinc-oxide-eugenol.

In deep cavities (30 to 50 microns from the pulp) filled with aquadont, zinc-oxide-eugenol or connective tissue, the calcio-traumatic reaction under the cavity was mildly but definitely more prominent than in the unoperated regions of the dentin (1). The postoperative dentin was normal in quality and quantity (N). This indicates a mild and transitory injury to the odontoblasts in deep cavities filled with these substances (Fig. 3, below left). Again the effect in cavities filled with connective tissue was, in general, more prominent than in those filled with aquadont or zinc-oxide-eugenol, and the recovery slightly delayed as seen in a tendency for hypocalcification of the postoperative dentin (Table 1).

In very deep cavities (15 to 25 microns from the pulp), the calcio-traumatic effect was much more prominent (2), and a few cells were always destroyed with the formation of a small localized region of dentin hypoplasia similar to that shown in Figure 3, below right.

Group B—Very Mild Reaction • The majority of the chemical agents used (benzalkonium chloride, hydrogen peroxide, acrylic monomer, chloroform, beechwood creosote, eucalyptol, eugenol and thymol) showed only a very mild effect on the odontoblasts. No effects were observed in shallow and medium cavities (Table 1 and Fig. 3, above right). Under deep cavities, the calcio-traumatic reaction was little if at all accentuated when compared with the unoperated and nonmedicated portions of the dentin. The recovery of the odontoblasts under deep cavities, however, was slightly slower than in the controls as evidenced in a slight disturbance in the calcification and occasional small hypoplasia of the postoperative dentin (Fig. 3, below right, and Table 2, Group B).

The absence of an obvious effect on the odontoblasts in deep cavities was surprising, since the dentin in the rat incisor is more permeable than the dentin of human teeth.[9]

From these findings it may be concluded that the substances in Group B can be applied to the freshly cut dentin of human teeth for ten minutes or less, even in deep cavities, without significant injury to the odontoblasts or the pulp. Whether these substances are effective in sterilizing the dentin is another question.

Group C—Mild Reaction • Three substances, alcohol 95 per cent, sodium fluoride 4 per cent, and sodium silicofluoride 0.9 per cent, produced a mildly injurious effect on the odontoblasts when compared to the effect seen in the controls in Group A. In medium cavities, the calcio-traumatic reaction was slightly accentuated and in deep and very deep cavities it was definitely accentuated (Table 1). The postoperative dentin also was slightly disturbed in its calcification in the deep cavities, while the hypoplastic defects were more extensive in the very deep cavities. No effects were observed in the subodontoblastic portions of the pulp.

The sodium silicofluoride solution was more injurious than the sodium fluoride solution, and both were more injurious than the alcohol when each was applied

Table 2 • Types of odontoblastic reactions to medicaments applied for ten minutes to dental cavities prepared at different depths in rat incisors

	Depth of cavity*	Reaction		Drugs (10 min. application)
		Acute calcio-traumatic	Post-operative dentin	
Group A Controls	Shallow	N	N	Aquadont
	Medium	N or 1	N	Zinc-oxide-eugenol
	Deep	1	N	Open cavities filled with
	Very deep	Hypoplasia	(small)	conn. tissue
Group B Very mild reaction	Shallow	N	N	Benzalkonium chloride
	Medium	N or 1	N	Hydrogen peroxide
	Deep	1	1	Acrylic monomer
	Very deep	Hypoplasia	(small)	Chloroform
				Beechwood creosote
				Eucalyptol
				Eugenol
				Thymol
Group C Mild reaction	Shallow	N	N	Alcohol 95%
	Medium	1	N	Sodium fluoride 4%
	Deep	1 or 2	1 or 2	Sodium silicofluoride 0.9%
	Very deep	Hypoplasia	(moder.)	
Group D Moderate reaction	Shallow	N	N	Phenol compd.
	Medium	2 or 3	N or 1	Phenol
	Deep	3 or 4	1	
	Very deep	Hypo and Aplasia		
Group E Severe reaction	Shallow	1	N	
	Medium	Hypoplasia	(at 55 μ)	
	Deep	Aplasia	(at 25 μ)	Orthophosphoric acid
	Very deep	Destruction of pulp		
Group F Destructive reaction	Shallow	3 or 4	1 or 2	
	Medium	Hypo and Aplasia		Silver nitrate
	Deep	Destruction of pulp		

Total no. animals—188.
*Same abbreviations and criteria as in Table 1.

for exactly ten minutes. Here again, however, minor variations in cavity depth overshadowed the differences among these substances so that it was more convenient to group them together than to attempt a detailed periodic table of the substances tested.

The effects observed of the action of the fluoride solutions applied topically to freshly cut dentin is in accord with the effects reported in the literature. The degree of injury to the odontoblasts, after ten minutes' application, was very mild and probably not significant clinically. The effect of these materials when sealed in for long periods of time undoubtedly is more profound.[14, 16] It is important to note that the effect of the fluorides was much less injurious than would be supposed from a cursory review of the literature. Sodium fluoride was but slightly more injurious than alcohol 95 per cent, which clinically produces a very painful, but apparently not very injurious, pulpal reaction. The suggestion by Maurice and Schour[21] to add sodium fluoride in very small amounts to filling materials in order to render the margins of the filling less liable to recurrent caries probably is not without merit. It is possible, however, that the topical application of a fluoride solution to the freshly cut cavity preparation for five minutes prior to the insertion of the filling would be more effective in this respect and less injurious to the pulp.

Effect of Phenol and Phenol Compound; Group D—Moderate Reaction • Phenol and phenol compound (phenol 27.0 Gm., thymol 6.0 Gm., and menthol 3.0 Gm.) produced no untoward effect on the odontoblasts when placed in shallow cavities. In medium cavities, a noticeable calcio-traumatic reaction resulted (2 or 3) (Fig. 4, above left). In deep cavities the acute (calcio-traumatic) effect on the cells was very severe (3 or 4), but the recovery of these cells was surprisingly good (postoperative dentin calcification, 1). In very deep cavities, the destruction of the odontoblasts was obvious and severe (Tables 1 and 2 and Fig. 4, below left).

Phenol was significantly more injurious than phenol compound when each was applied for exactly 1 or 10 minutes to the freshly cut dentin under the conditions of this experiment. Here again, however, minor differences in cavity depth overshadowed the differences between the two substances, so that it was more expedient and correct to place these together in a group.

The effect observed in this experiment appeared to be much less injurious than would be supposed from observing the caustic action of phenol on soft tissue such as the gingiva and tongue. It is obvious that the action of the phenol is limited by the dentin.

The mild and limited action of phenol on the pulp is consistent with findings by Thomas[12] and Kramer and McLean.[13] Zander and Glass[22] applied phenol to freshly amputated pulp stumps (pulpotomy) and observed a localized necrosis with vital cell differentiation under the zone of necrosis and the formation of a calcific bridge under the necrotic region which compared favorably with the nonphenolized controls. These findings, coupled with the fact that phenol produced only a moderate effect when applied very closely to the highly reactive pulp of the rat incisor, led to the conclusion that phenol does not penetrate the dentin when applied for ten minutes or less and that its action is very limited and not injurious except when applied very close to the pulp.

Effect of Orthophosphoric Acid: Group E—Severe Reaction • Orthophosphoric

21. Maurice, C. G., and Schour, I. Effects of sodium fluoride upon the pulp of the rat molar. J. D. Res. In press.

22. Zander, H. A., and Glass, R. L. Healing of phenolized pulp exposures. Oral Surg., Oral Med. & Oral Path. 2:803 June 1949.

acid is the liquid used in mixing zinc phosphate cements and silicates. When this liquid was applied for ten minutes to freshly cut dentinal cavities approximately 55 microns from the pulp, death of many of the underlying odontoblasts resulted, with the formation of large hypoplastic areas in the postoperative dentin (Table 1 and Fig. 4, above right). In deeper cavities (approximately 20 microns from the pulp), the acid decalcified the intervening dentin, entered the pulp and produced abscesses within the pulp (Fig. 4, below right).

The orthophosphoric acid, therefore, was far more destructive than was the phenol, since the material was able to penetrate through the dentin, and the injury extended beyond the odontoblastic layer into the pulp when applied in deep cavities.

Since it has been estimated that the orthophosphoric acid used clinically in mixing cements and silicates remains as a free acid (pH 2.0) for only two to four minutes after application to the cavity, two specimens in this series were treated by applying the acid for only one minute. The effect produced did not differ significantly from the effect described after ten minute applications. It may be concluded, therefore, that the destructive effect produced by zinc phosphate cements and silicates on the pulp as shown by Manley,[23] Zander,[24] Silberkweit[9] and others are probably caused by the action of the orthophosphoric acid used in these mixtures.

Effect of Silver Nitrate: Group F—Destructive Reaction • Silver nitrate was applied for ten minutes to the freshly cut dentin as the saturated solution or as the ammoniacal solution (Howe's).[25] At the end of ten minutes, each solution was neutralized by eugenol or by Formalin or was not neutralized at all, but was wiped dry, after which the cavity was filled with aquadont.

In all instances, the silver nitrate was very destructive even in relatively shallow cavities. Hypoplastic dentin usually formed under the shallow cavities, and huge necrotic regions in the pulp were observed regularly under medium and deep cavities (Fig. 5).

In general, ammoniacal silver nitrate appeared to be more destructive and penetrated the dentin more readily than did a saturated solution of silver nitrate. Reduction of the silver nitrate (ammoniacal or in saturated solution) by Formalin resulted in more severe effects on the pulp than did reduction with eugenol (Table 1). The difference in effect after various methods were used to apply or reduce the silver nitrate solutions was relatively small, however, when compared to the grossly destructive effect or when compared to the relatively less injurious effect produced by orthophosphoric acid on the pulp or the moderate effect of phenol on the odontoblasts.

In specimens with shallow cavities to which any form of silver nitrate was applied, there could be seen a black layer of precipitated silver deep into the substance of the dentin (Fig. 5, above left). This layer of precipitated silver was found in specimens in which the silver nitrate was not reduced as well as in specimens in which it was reduced by eugenol or Formalin. The silver nitrate which penetrated deeply into the dentin was not reduced by the eugenol or Formalin since these could not have penetrated to this depth in so short a time, but probably was reduced by proteins in the dentinal tubules. It is our impression that the eugenol and Formalin reduced only the silver nitrate on or near the surface of the dentin. This point, however, requires further clarification.

23. Manley, E. B. Review of pulp reactions to chemical irritation. Internat. D. J. 1:36 Dec. 1950.

24. Zander, H. A. Reaction of dental pulps to silicate cements. J.A.D.A. 33:1233 Oct. 1946.

25. Howe, P. R. Method of sterilizing, and at the same time impregnating with metal, affected dentinal tissue. D. Cosmos 59:891 Sept. 1917.

In all specimens, reduced or otherwise, the silver nitrate penetrated quickly and deeply into the dentin and often through the entire thickness of the dentin. This finding supports similar findings by Zander[26] and Zander and Smith[11] and contradicts the contention held by many clinicians that silver nitrate will penetrate only carious dentin and will not penetrate sound dentin. Furthermore, the injurious action of the silver nitrate extended beyond and below the layer of precipitated silver. Severe aplasia under even shallow cavities treated with silver nitrate indicate a severe injury to the odontoblasts at a level well below the layer of precipitated silver (Fig. 5, above left). In medium cavities, large necrotic regions could be observed regularly deep

26. Zander, H. Use of silver nitrate in the treatment of caries. J.A.D.A. 28:1260 Aug. 1941.

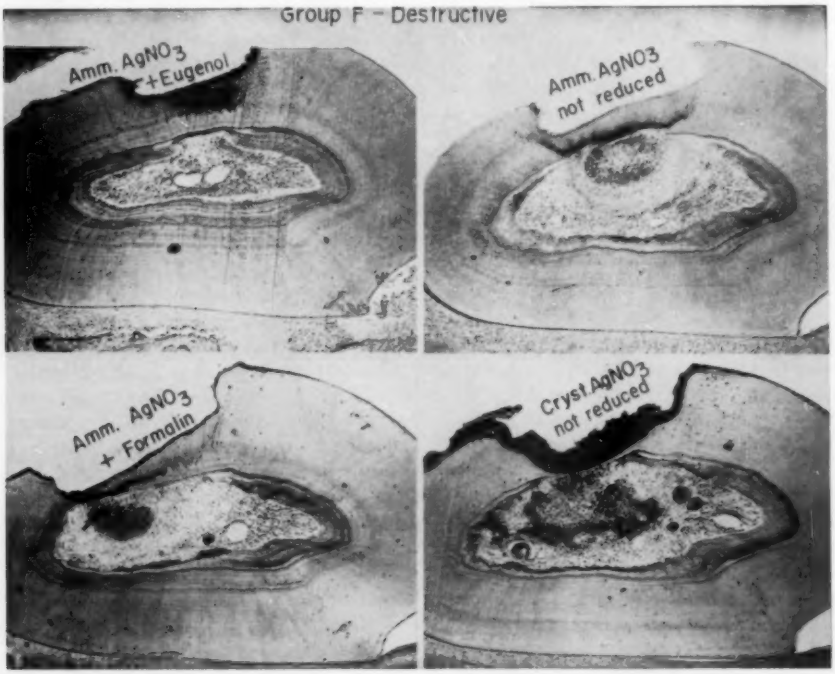

Fig. 5 • Violent and destructive effect produced by silver nitrate applied for 10 minutes. Above left: Ammoniacal silver nitrate (Howe's) applied to shallow cavity (125 microns from pulp) for ten minutes and reduced with eugenol. Below left: Ammoniacal silver nitrate (Howe's) applied to deeper cavity (approximately 30 microns from pulp) for ten minutes and reduced with Formalin. Note penetration and precipitation of silver through dentin and into pulp. Note aplasia under and to left of cavity as well as abscess in pulp. Above right: Ammoniacal silver nitrate (Howe's) applied to medium cavity (approximately 60 microns from pulp) for ten minutes and not reduced. Note precipitation of silver at pulpal border and large abscess formed in pulp under cavity. Note also aplasia under cavity and hypoplasia to the left and opposite cavity preparation. Below right: A crystal of silver nitrate was wet with water and applied to dentin for ten minutes, without reduction (cavity depth approximately 40 microns). Note blackening of entire dentin with destruction of its structural elements and complete destruction of pulp

in the pulp under the odontoblasts, well in advance of the layer of precipitated silver (Fig. 5, below left). These findings indicate that the caustic action of the silver nitrate is not self-limited, and that it extends well beyond the region of precipitation. When the layer of black precipitated silver came close to or entered into the pulp, extensive regions of necrosis resulted (Fig. 5).

The observation that silver nitrate penetrates quickly and deeply into sound dentin is supported by similar observations in human teeth.[3, 5, 10, 11, 26] None of these investigators, however, observed as severe injury to the pulp as has been demonstrated in the present study. The reason may be the greater permeability of the dentin of the rat incisor and the greater reactivity of its pulpal cells.

Effect of Drugs Sealed into Cavities for 2 to 3 Days • The effect of a given drug on the pulp increases significantly with time when the drug is sealed into cavities and the contact with the freshly cut odontoblastic processes is prolonged. Zander and Smith[11] showed this to be true for the effect of silver nitrate. Lefkowitz and Bodecker[14] and Maurice[16] showed this to be true for sodium fluoride.

Since only minor differences in the odontoblastic reaction could be observed when essential oils were applied for only ten minutes to the freshly cut dentin, and since these substances sometimes are sealed into dentinal cavities for two to seven days in endodontic procedures, 18 specimens were prepared wherein the respective drugs were sealed into the dentinal cavities of the rat incisor for two to three days. The results are summarized in Table 3.

Examination of this material shows that the effect of each substance increased significantly as the time of contact with the freshly cut odontoblastic processes increased, especially in deep cavities. The effect differed for each substance. When eugenol was sealed in for two days, the effect on the odontoblasts was increased only very slightly and then only in a deep cavity. The effect of benzalkonium chloride 1:1,000, hydrogen peroxide 4 per cent, and thymol was very slightly increased after being sealed into cavities for two or three days, and then only in moderately deep cavities (Table 3). The effect produced by chloroform, creosote, eucalyptol, and especially alcohol 95 per cent, was considerably increased after they had been sealed in for two or three days (Fig. 6). Surprisingly, the effect of sodium fluoride and sodium silicofluoride solutions was only mildly increased after being sealed in for two days (Table 3).

It is significant that none of the substances in these groups penetrated beyond the odontoblastic layer even when sealed in deep cavities for two or three days. In every instance, the effects were confined to the odontoblasts. The subodontoblastic pulpal tissue was not affected. It appears, therefore, that the action of these drugs was mediated solely through the freshly cut odontoblastic processes and, in contrast to orthophosphoric acid and silver nitrate, these drugs did not penetrate through the highly permeable dentin of the rat incisor within the two or three day experimental period. It would be desirable to repeat these experiments, sealing the substances into experimental cavities for seven days, or more, in order to discover the time required for each substance to penetrate through the dentin into the subodontoblastic regions of the pulp. Thomas[12] indicated that phenol will penetrate through the entire thickness of human dentin in 22 hours when sealed into dentinal cavities. Silver nitrate penetrates the dentin within minutes. The rate of penetration of the other germicides such as eugenol, thymol and alcohol, is not known.

DISCUSSION

The findings obtained in this study indicate that, with the exception of silver

nitrate and orthophosphoric acid, none of the agents used in this study seriously injured the odontoblasts or the pulp. Benzalkonium chloride 1:1,000, hydrogen peroxide 4 per cent, beechwood creosote, eucalyptol, thymol, chloroform, acrylic monomer, eugenol and phenol had a very limited range of action—on the odontoblasts only, probably through the freshly cut protoplasmic processes of these cells. None of these substances penetrated through the dentin or beyond the odontoblastic layer into the subodontoblastic layers of the pulp even when placed within 25 microns of the pulp and even when sealed into the cavity for two or three days. The effects, when present, were confined solely to the odontoblasts as evidenced by the altered activities of these cells.

This effect was in direct contrast to the rapid penetration and destructive action of orthophosphoric acid and silver nitrate. The latter penetrated through half the thickness of the dentin with great rapidity and acted directly on the pulp with great destructiveness.

Mechanism of Destructive Effect by Silver Nitrate • Stephan, Muntz and Dorfman,[5] in an excellent series of studies, showed that all the sterilizing agents commonly used in dental practice, with the exception of silver nitrate solutions and 30 per cent hydrogen peroxide, failed to penetrate into the substance of the dentin and acted only on the surface when applied *in vitro* for three minutes to dentin cubes. Seltzer[6,7] and Hardwick[3] confirmed and supported this conclusion by bacteriologic studies *in vivo*. They demonstrated that all sterilizing agents failed consistently to sterilize the infected dentin under carious lesions when applied for two or three minutes. It is generally concluded, therefore, that the germicides commonly used in dental practice, with the possible exception of silver nitrate, are surface disinfectants only and do not sterilize the underlying dentin when applied briefly and topically to the dentinal cavity. Silver nitrate, on the other hand, penetrates rapidly into dentin and into the pulp. Stephan, Muntz and Dorfman[5] demonstrated a penetration of 0.6 and 0.7 mm. after a three minute application of silver nitrate, and a penetration of 1.8 mm. after a ten minute application. The objection to the use of silver nitrate is that the deeper the penetration and the closer it comes to the pulp, the greater the injury to the pulp. Even those investigators who praise its other virtues recognize this fault.

Another important consideration in the destructive effects produced by silver nitrate is that its action continues long after it has been precipitated by eugenol or Formalin.[11] This continued action may be caused by the failure of the eugenol or Formalin to penetrate the tubules. Whatever the explanation, it has been shown that the effect of silver nitrate on the pulp increases with time.[10] In this respect its action is similar to the continued action of injurious chemical agents contained in filling materials such as silicates.[9,24] The absence of pulpal pain after clinical use of silver nitrate probably is related to the fact that the pulp goes through a process of sterile necrosis, without showing any subjective clinical symptoms.

It may be concluded, at least tentatively, therefore, that the destructive action by silver nitrate is the result of (1) its caustic properties, (2) its power of penetration through the dentin and (3) its continued action after precipitation.

Correlation With Studies in Human Teeth • The findings obtained in this study agree substantially with the few histologic studies made in human teeth on the effects of phenol,[12,13] the essential oils,[3,8] and sodium fluoride.[14-16] The effect of orthophosphoric acid as observed in this study is similar to the injurious effect observed in rats under zinc phosphate and silicate cements by Sil-

berkweit,[9] in dogs by Manley[23] and in man by Zander.[24]

This study showed a much more severe effect from silver nitrate than has been reported by others.[3, 8, 10, 11, 27] The reason for this finding may be the fact that: (1) the dentin of the rat incisor is more permeable than is human dentin, and (2) the reaction of the odontoblasts in the continuously and rapidly growing tooth is much greater than in the slower growing human dentin.[28] It will be necessary to repeat the application of silver nitrate to cavities prepared in human teeth and to study the histologic effects more care-

27. Ireland, R. L. Ammoniacal silver nitrate as a sterilizing agent for deep-seated decay in deciduous teeth. J.A.D.A. 26:871 June 1939.

28. Klein, H., and Knutson, J. W. Studies on dental caries. XIII. Effect of ammoniacal silver nitrate on caries in first permanent molar. J.A.D.A. 29:1420 Aug. 1942.

Table 3 • Effects of medicaments sealed in dental cavities for two to three days

Substance tested	Spec. no.	Depth of cavity*	Reaction after 2-3 days		Reaction at equivalent depth after 10 minute application	
			Acute calcio-traum. reaction	Postoper. dentin calcif. & struct.	Acute calcio-traum. reaction	Postoper. dentin calcif. & struct.
Eugenol	140B	92	1	N	N	N
	147	62	N	N	1	N
	140A	30	2	N	1	N
Benzalkonium chloride	152	85	1	N	N	N
Hydrogen peroxide	316B	84	N	N	N	N
	313B	80	1	N	N	N
	320A	70	1	N	N	N
	316A	25	Aplasia		?	
	313A	14	Aplasia		?	(No specimens)
Thymol	155	75	1	2	1	N
Creosote	141	95	2	N	N	N
	138	50	2 & 4	4	1	N
Chloroform	143	80	3 & 4	4	1	N
Eucalyptol	137B	87	1	1	1	N
	137A	55	3 & 4 Hypoplasia		1	N
Sodium fluoride 4%	149	115	1	N	N	N
	145	20	3 & 4 Hypoplasia		Hypoplasia	(small)
Sodium silicofluoride 0.9%	144B	125	N	N	N	N
	151	70	N	N	1	N
	144A	30	2 & 4	N	Hypoplasia	(small)
Alcohol 95%	312B	100	1	1	N	N
	315B	96	1	4	N	N
	312A	64	2	4	1	N
	315A	52	2 & 4 Hypoplasia		1	N
	318	12	Hypoplasia		?	

Total no. animals—18.
*Distance from pulp in microns.

fully before more definitive conclusions may be drawn.

Silver nitrate solutions have been used clinically to arrest incipient enamel and dentin caries in the teeth of children. Klein and Knutson[28] showed that this procedure is ineffective when subjected to actual clinical testing. James and Parfitt[29] recently have retested the efficacy of silver nitrate in arresting decay in the teeth of children. They also found this procedure to be ineffective. In any case, the rationale for the use of silver nitrate in human teeth, carious or otherwise, should be re-examined.

Sterilization of Dentin • Most clinicians would be happy to use a sterilizing agent on freshly cut dentin in spite of the suggestion by Besic[30] and others that the bacteria within the tubules tend to die out if the cavity is properly filled. Besic[30] stresses the fact that the filling must produce a perfect marginal seal which permits no leakage. He points out further that the bacteria remain viable for 9 to 18 months even under these conditions. Everyone agrees that sterilization of the dentin under a cavity preparation would be most desirable if an agent could be found which is effective and is not injurious to the pulp. These qualifications are especially desirable in a sterilizing agent used in very deep cavities where sterilization rather than removal of the last layer of carious dentin would prevent traumatic injury to the pulp and pulp exposure and permit recovery and healing by secondary dentin formation. The latter action (indirect pulp capping) would prevent the loss of thousands of teeth by extraction.

A number of studies have shown that the essential oils, phenol derivatives, cationic detergents, organic dyes, halogens and other sterilizing agents, with the exception of silver nitrate, are clinically ineffective when applied topically to the dentin for less than ten minutes.[3, 6, 8] The present study establishes the fact that these agents also are not harmful to the pulp; however, they also are not effective probably because they do not penetrate through the dentin in the time allotted.[5] Although silver nitrate does penetrate through the dentin and probably is a more effective sterilizing agent, this study indicates that its use in deep cavities is contraindicated because of its caustic action on the pulp.

Thus a contradiction exists in that the harmless substances are ineffective and the effective agent is harmful. This problem, however, is not insoluble.

Eugenol is a potent germicide and it is palliative to the pulp when applied over short or long periods of time.[23, 31] It is an efficient obtundent for the relief of the pain of pulpitis, and it is frequently sealed in carious and noncarious cavities for long periods of time in the form of zinc oxide and eugenol cement to sedate the pulp. It is suggested that the sealing in of this agent for three to seven days may permit effective penetration of this volatile oil through the dentin. If this is true, under these conditions, eugenol should effectively sterilize the carious material without injury to the pulp. The prolonged sterilizing action of zinc oxide and eugenol has been demonstrated *in vitro* by Turkheim.[32] He showed that zinc oxide and eugenol was the only filling material to inhibit bacterial growth effectively *in vitro* over a long period of time.

The rate at which eugenol can penetrate through the dentin is not known and should be determined experimentally. Hardwick[3] found that zinc oxide and eugenol sealed in for three hours

29. James, P. M. C., and Parfitt, G. J. Clinical note on the use of silver nitrate in the prevention of fissure caries in newly erupted first permanent molars. Brit. D. J. 96:35 Jan. 19, 1954.

30. Besic, F. C. Fate of bacteria sealed in dental cavities. J. D. Res. 22:349 Oct. 1943.

31. James, V. E., and Diefenbach, G. B. Prevention of histopathologic changes in young dogs' teeth by use of zinc oxide and eugenol. J.A.D.A. 29:583 April 1942.

32. Turkheim, H. J. Bacteriological investigations on dental filling materials. Brit. D. J. 95:1 July 7, 1953.

yielded a bactericidal index of 53 per cent and was much more effective than eugenol applied topically for three minutes which yielded a bactericidal index of 30 per cent. The bactericidal index of phenol was 15 per cent and that of silver nitrate, 65 per cent to 74 per cent. Thomas[12] indicates that phenol penetrates through the dentin in 22 hours. Since eugenol is more volatile than phenol as well as a more effective germicide *in vivo*, it is logical to assume that eugenol may penetrate and sterilize the infected dentin completely if sealed in for three to seven days. This hypothesis, however, must be proved by direct experimentation. If it does sterilize the dentin, it would be an ideal agent for clinical use since, in addition, it soothes the pulp and is palliative to the pulpal cells.

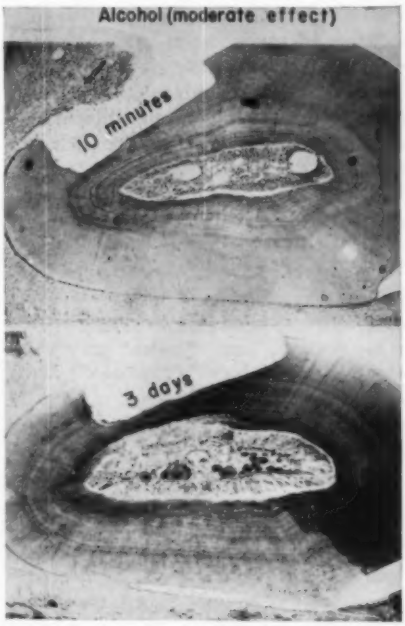

Fig. 6 • Moderate reaction caused by drug such as alcohol 95 per cent when sealed in for three days. Above: Topical application for ten minutes. Below: After drug has been sealed in cavity for three days. Note complete destruction of odontoblasts under cavity and aplasia. Pulp under odontoblastic layer is not affected

SUMMARY AND CONCLUSIONS

In spite of the fact that silver nitrate and phenol have been and are being used in thousands of teeth in an attempt to sterilize the dentin, their effect on the dental pulp has been studied only infrequently by histologic methods. The histologic effect on the pulp of other agents such as eugenol, thymol, alcohol, chloroform and benzalkonium chloride has never been studied on a comparative basis under controlled conditions.

This investigation was designed to study the relative effects on the pulp of a number of sterilizing and chemical agents commonly used in dentistry, by applying these medicaments to cavities prepared in the incisors of 188 rats for a period of ten minutes.

The results show that:

1. The deeper the cavity preparation, the greater the effects of the operative trauma and the medicaments on the odontoblasts and the pulp. The calciotraumatic reaction, which indicates acute injury to the odontoblasts at the time of operation, becomes significantly accentuated when the cavity floor reaches a critical level approximately 50 microns from the pulp. Severe injury to the odontoblasts as evidenced by dentin hypoplasia resulted when the floor of the cavity came within 25 microns from the pulp (Table 1).

2. Eugenol, thymol, eucalyptol, beechwood creosote, chloroform, acrylic monomer, hydrogen peroxide 4 per cent, and benzalkonium chloride 1:1,000 (Group B) produced little or no additional injury to the odontoblasts or the pulp when these were applied for ten minutes or less, even in deep cavity preparations (Table 2). In this group, differences in odonto-

blastic reactions were determined by differences in cavity depth rather than by different medicaments.

3. Alcohol 95 per cent, sodium fluoride 4 per cent and sodium silicofluoride 0.9 per cent (Group C) caused a slight injury to the odontoblasts when applied under the same conditions, in deep cavity preparations. No effects were observed in shallow cavity preparations (Table 2). None of these substances penetrated to or injured the pulp under the odontoblasts even when applied in very deep cavities.

4. Phenol and phenol compound (Group D) produced a moderately acute reaction when applied for ten minutes to medium cavities and a more severe injury to the odontoblasts in very deep cavities (Table 2). However, phenol did not penetrate into nor produce a destructive reaction in the pulp itself.

5. The action of most of the medicaments here investigated was more severe (to different degrees) when they were sealed into the cavities for two or three days. Even after such prolonged contact with the freshly cut protoplasmic processes of the odontoblasts, however, these medicaments did not produce destructive effects on the pulp. Prolonged contact interfered only with odontoblastic functions.

6. Since the dentin of the rat incisor is more permeable than human dentin and since the sensitivity of the rapidly growing dentin-forming cells far exceeds the sensitivity of the same type of cells in the human pulp, it is felt that the application of these medicaments and chemical agents to freshly cut human dentin for ten minutes or less should produce no significant injury to the pulp or its cells even in deep cavity preparations.

7. Orthophosphoric acid and silver nitrate produced destructive reactions in the pulp. Orthophosphoric acid produced hypoplasia in medium cavities, aplasia in deep cavities and destruction of the pulp (inflammation and abscess formation) under very deep cavities. Silver nitrate produced hypoplasia in even shallow cavities and complete death of cells in pulpal necrosis under medium and deep cavities.

8. In view of the destructive action of silver nitrate on the pulp, its use in clinical dentistry for the sterilization of dentin in deep carious lesions should be questioned.

There is an obvious need for a simple, rapid and inexpensive method for the bio-assay of the effects on the dental pulp of the many new and old filling materials and drugs before they are recommended for use in human teeth. The results of this and previous investigations[9, 16, 18, 19] indicate that this need can be met adequately by cavity preparations made in the rat incisor for the assessment of effects on the young growing pulp and in the rat molar for the effects on the older (adult) pulp.

Prospects for Tomorrow's Researcher • We of the mid-twentieth century have been moving forward to a considerable degree because of the momentum accumulated in the days of the amateur and the lone inventor. . . . Whether there will continue to be a favorable cultural atmosphere for the exceptional man with really new ideas in science I have some doubt. *James B. Conant.*

Radiation exposure to the head and abdomen during oral roentgenography

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Recent studies directed toward evaluation of radiation hazards to the patient and operator during a routine full mouth intraoral roentgenographic examination have suggested that the problem is one of pressing concern.[1-3] Although the problems of exposure of operator and patient to radiation are interrelated, they are not necessarily inseparable since various alterations in technic, apparatus and film are possible which might minimize the exposure to radiation of either party or both.

According to Nolan,[3] ten patients who received full mouth roentgenographic examination were exposed to the following amounts of radiation respectively: 35 r, 115 r, 135 r, 65 r, 315 r, 315 r, 285 r, 282 r, 285 r and 280 r. It is well that this much-needed information has been brought to the attention of the dental profession. These data are deceiving, however, inasmuch as the findings were apparently based on the assumption that radiation doses to various contiguous parts of the body can be added to give the total radiation exposure. This present study was performed in an attempt to reevaluate the hazards when different technics were used and to express the results in terms of the doses actually delivered to any particular area.

Also, since relatively small amounts of radiation are known to induce genetic changes, considerable alarm has been expressed recently[4,5] with regard to the possible effects of roentgen radiation during the taking of pelvic roentgenograms and of fluoroscopy on the ovaries and germ plasm or on the fetus during pregnancy.

Even though the extent of the adverse effects of roentgen radiation during pregnancy depends on the period at which the radiation is received, the hazards of radiation were considered a sufficiently significant source of concern to warrant a study to determine the approximate amount of radiation delivered to an area of skin overlying a developing fetus dur-

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This study was supported in part by grants-in-aid from Ciba Pharmaceutical Products, Inc., Summit, N. J., and Charles Pfizer & Co., Brooklyn, N. Y.

1. Budowsky, J., and Kutscher, A. H. Exposure to x-radiation during the general practice of dentistry. New York D. J. 19:298 June-July 1953.

2. Jacobson, L. E., and Sheppard, I. M. X-ray hazards and protection in dental radiography. New York D. J. 18:367 Oct. 1952.

3. Nolan, W. E. Radiation hazards to the patient from oral roentgenography. J.A.D.A. 47:681 Dec. 1953.

4. Russell, L. B., and Russell, W. L. Radiation hazards to embryo and fetus. Radiology 58:369, 1953.

5. X-rays during pregnancy. Editorial. J.A.M.A. 153: 218 Sept. 19, 1953.

Table 1 • Exposure time, angulation and physical data on X-ray unit and Victoreen condenser r meter

X-ray unit		
Manufacturer	X-ray Corporation of America	
Model no.	3A	
Serial no.	4197	
Kilovoltage	65	
Milliamperage	10	
Filtration	0.5 mm. aluminum (inherent)	
Condenser r meter	Victoreen	
Ionization chambers	100 r and 25 r	
Target to tip of cone	8 inches (short cone technic) field size at 8 inches was 4½ inches in diameter	
	Angulation	Exposure (sec.)
Upper molar	+ 20°	4½
Upper bicuspid	+ 30°	3
Upper cuspid	+ 45°	2½
Upper central incisor	+ 40°	3
Lower central incisor	− 15°	2
Lower cuspid	− 20°	2½
Lower bicuspid	− 10°	2½
Lower molar	− 5°	3

ing the course of exposure of full mouth intraoral roentgenograms.

METHODS

The internationally accepted unit of x-ray quantity is determined by the ionization produced in a fixed mass of air and is defined as follows: "The roentgen (r) shall be the quantity of x- or gamma radiation such that the associated corpuscular emission per 0.001293 gm. of air, produces, in air, ions carrying 1 esu of quantity of electricity of either sign."[6,7] The mass of 1 cc. of dry atmospheric air at 0° C. and 760 mm. of mercury pressure is 0.001293 Gm.[7] The present permissible dose for x or gamma rays per week (which refers to total body exposure) is .3 r (300 mr).

Forty adult volunteer patients, aged 35 to 71 (35 men and 5 women), were studied during the course of exposure of one full mouth series of periapical roentgenograms. During the entire period of 14 exposures, a thimble ionization chamber was maintained in one fixed position on the face of the patient. Details concerning the technics of exposure, times, angulation, and so forth are included in Table 1. The standard eight inch focal distance (distance between the tube target and the skin) was used during the entire study. The machine was operated at 65 kv. and 10 ma. with an aluminum filter .5 mm. thick. An X-ray Corporation of America x-ray unit Model 3A Serial No. 4197 was used exclusively throughout these experiments. The characteristics (filter factors, and so forth) of the x-ray machine together with the electrical settings are also included in Table 1.

The full mouth series of roentgenograms included a periapical film of each of the following 14 areas: upper right molar, upper right bicuspid, upper right cuspid, upper central incisor, upper left cuspid, upper left bicuspid, and upper left molar, as well as of the same tooth areas in the lower jaw. Exposure for each area was made in accordance with the directions for exposure of Eastman Kodak radiatized film (Table 1). Complete exposure of both arches required approximately 41 seconds.

In order to evaluate the radiation exposure of each specific facial area studied, the Victoreen ionization chamber was centered directly on the face in the area of maximum exposure to roentgen rays for the roentgenogram of that area of the mouth. The chamber was maintained without movement in a position perpendicular to the floor, and in the same area while this and the 13 remaining areas were properly exposed; that is, in one patient the ionization chamber was placed on the cheek surface directly in the position where the roentgen ray beam was of maximum intensity when exposing the upper molar roentgenograms, and the ionization chamber was then

6. Sixth International Congress of Radiology. Recommendations of the International Commission on radiological protection. National Bureau of Standards Handbook No. 47. Washington, D. C., Superintendent of Documents, 1951.

7. Glasser, O., and others. Physical foundations of radiology, ed. 2. New York, Paul Hoeber, Inc., 1952, p. 184.

maintained in this position while each of the remaining 13 exposures constituting the full mouth series was performed; on the next patient the ionization chamber was maintained in the center of the proper position for exposing the area of the upper bicuspid teeth during the taking of full mouth roentgenograms; in the next patient, the area of the upper cuspid, and so forth (see illustration).

Thus, in the over-all experiment, exposure to radiation was evaluated in 40 different patients in the course of 40 different full mouth series including eight basic areas: upper molar, lower molar, upper bicuspid, lower bicuspid, upper cuspid, lower cuspid, upper central incisor and lower central incisor.

This procedure was repeated with additional patients until full sets of areas (upper and lower) had been studied. Because of the bilateral symmetry of the face and head, it was assumed that readings on the right side would be directly comparable to readings on the left side, and hence the readings from all upper molar areas, whether right or left, have been considered together. Similarly all determinations of upper bicuspid areas, cuspid and central incisor areas were pooled together respectively for evaluation in each area.

After completion of exposure of the full mouth series of roentgenograms, the ionization chamber was returned to the Victoreen condenser r-meter, and the roentgen ray dosage was recorded. At the conclusion of the testing procedures, the Victoreen condenser and ionization chambers were recalibrated and the correction factor obtained was applied to the readings. In these studies a 100 r ionization chamber was used.

To establish the intercurrent exposure to radiation in the lower abdominal area during intraoral roentgenographic procedures, an ionization (25 r) chamber was placed externally on the clothing in this area in the course of these procedures with 25 of the 40 patients. This ionization chamber was similarly maintained in one position throughout the full mouth series of roentgenograms.

Exposure of the upper right cuspid area while patient holds ionization chamber to cheek surface directly in the position where roentgen ray beam is of maximum intensity when exposing the upper cuspid roentgenogram. Patient continued to hold the chamber in the same area while remaining 13 roentgenograms were taken

RESULTS

Table 2 shows the results of the studies mentioned and provides the corrected readings obtained in the 40 face and 25 abdominal evaluations. Table 2 also summarizes for each area the average exposure and the range of exposure to radiation for that area during the course of a full mouth series of roentgenograms based on five readings for each position.

Although our findings were lower (Nolan's data were for as many as 30 exposures as opposed to our series of 14)

Table 2 • Individual readings and summary obtained from 40 evaluations of radiation exposure to the skin of eight areas of the head and neck during full mouth exposure of a series of 14 periapical intraoral roentgenograms as determined by the Victoreen ionization chamber condenser r meter

Region	Corrected readings (r)					Range of readings (r)	Average reading (r)
Upper molar	46.9	44.7	78.2	33.5	73.7	33.5-78.2	55.4
Upper bicuspid	69.25	82.7	84.9	91.6	55.9	55.9-91.6	76.9
Upper cuspid	58.1	71.5	80.4	84.9	58.1	58.1-84.9	70.6
Upper central incisor	64.8	53.6	89.4	78.2	33.5	33.5-89.4	63.9
Lower molar	55.9	82.7	55.9	33.5	67.0	33.5-82.7	59.0
Lower bicuspid	53.6	67.8	67.0	33.5	60.3	33.5-67.0	55.8
Lower cuspid	53.6	58.1	60.3	78.2	55.9	53.6-78.2	61.3
Lower central incisor	35.7	64.8	33.5	44.7	49.1	33.5-64.8	46.0
Abdominal	0	2.2	0	0	0	0 - 5.6	0.45
	0	0	1.2	0	0		
	0	0	0	0	0		
	0	2.24	0	0	5.6		
	0	0	0	0	0		
Over-all average reading, head				61.1 r			
Over-all average reading, abdomen				0.45 r			
Over-all range of readings, head				33.5-91.6 r			
Over-all range of readings, abdomen				0-5.6 r			

than those of Nolan,[3] the readings obtained appear sufficiently high to warrant concern about the indiscriminate use of roentgen rays. The average exposure to the skin overlying the upper molar area during the course of full mouth roentgenographic examination was 55.4 r; of the skin in the upper bicuspid area, 76.9 r; upper cuspid area, 70.6 r; upper central incisor area, 63.9 r; lower molar area, 59.0 r; lower bicuspid area, 55.8 r; lower cuspid area, 61.3 r, and lower central incisor area, 46.0 r.

The exposure to radiation in the lower abdominal area averaged 0.45 r per full mouth series of roentgenograms but ranged from 0 to as high as 5.6 r. The low values usually obtained in the abdominal area may be explained by the inverse square law which holds that intensity varies inversely approximately as the square of the distance. The hazard to ovarian tissues and germ plasm or to a developing fetus incidental to present intraoral roentgenographic technics cannot be estimated with certainty, since there is as yet insufficient experimental evidence in human beings with regard to the minimum radiation exposure which may result in deleterious effects on the ovary or fetus—problems difficult to resolve in human beings.

DISCUSSION

Since 300 to 400 r may cause erythema, the dose received by the patient is far from insignificant.

More important, even, than the actual figures obtained is the need for realization of the potential dangers of roentgen ray radiation delivered to the patient. If these dangers are fully realized, then use of the x-ray machine will be routinely tempered with caution. Certainly, in so far as the patient is concerned, the installation of an aluminum filter, the use of a collimator, perhaps the use of the long cone technic (which possibly would increase the operator's exposure by virtue of increased exposure time), the use of a roentgen ray-proof shell housing for the

tube, and the possible use of protective clothing for the patient's neck and body to protect from secondary and scattered radiation, as suggested by Nolan,[3] are in order.

A study is now in progress dealing with the exposure of the patient and operator during the use of standard and more sensitive films. The results are not definite, as yet; however, a simple method of reducing danger of radiation to the patient might be to use faster speed x-ray film in place of the standard film. Such films are readily available commercially, and may provide pictures of reasonably comparable quality while at the same time they may decrease the radiation to the patient, possibly by as much as 75 per cent.

It is obvious that if more than 14 roentgenograms are taken in order to make a more complete full mouth survey, then the head would be exposed to more radiation. Similarly, repetition of the roentgenographic examination at too short intervals would also apparently compound these hazards. Therefore, the number of exposures of individual areas during endodontic treatment should be given careful consideration. Concomitant radiation during dermatologic therapy should be avoided or taken into account. If osteoradionecrosis of the jaws is present, further exposure for the purpose of making roentgenograms should be kept to an absolute minimum.

SUMMARY

In an effort to study further the exposure of patients to radiation, the roentgen ray dosage to various areas of the skin of the face during the taking of full mouth series of 14 periapical roentgenograms was determined directly through the use of a Victoreen ionization chamber. In the course of 40 full mouth series of roentgenograms taken of 40 individuals, the average exposure to radiation of the skin in the upper molar area was 55.4 r; in the upper bicuspid area, 76.9 r; in the upper cuspid area, 70.6 r; in the upper central incisor area, 63.9 r; in the lower bicuspid area, 55.8 r, and in the lower molar area, 59.0 r. The average exposure to radiation of the skin in the lower abdominal area was 0.45 r.

These observations indicate the magnitude of the radiation hazard to the patient during intraoral roentgenographic diagnosis. These hazards should be investigated so that the source of radiation and the area radiated can be controlled better. Whether the exposure of the patient can be decreased by using x-ray film of increased emulsion sensitivity with resultant decreased exposure time also should be investigated.

Power of Peace • A time will come when the science of destruction shall bend before the arts of peace; when the genius which multiplies our powers, which creates new products, which diffuses comfort and happiness among the great masses of the people, shall occupy in the general estimation of mankind that rank which reason and common sense now assigns to it. *Francois Arago.*

Prevention of malocclusion by the general practitioner

Earl E. Shepard, D.D.S., St. Louis

Measures for the prevention of malocclusion should be applied not only by orthodontic and pedodontic specialists but by the general practitioners of dentistry as well. In fact, the finest type of preventive orthodontics is good general dentistry, including an effective patient recall system—one that will motivate children to return to the dental office frequently and thus enable the dentist to avert one of the greatest causes of malocclusion—the premature loss of deciduous and permanent teeth.

Modern dental education has successfully indoctrinated today's dental student with the ideas and ideals of the prevention of malocclusion. Just as there are the indolent in any field of endeavor, however, there are dentists who do not put all their scientific knowledge to use.

Modern dental materials and technics have made the fabrication of appliances for preventive orthodontics comparatively simple. Modern space maintainers are infinitely simpler than the complex devices first described by Willett.[1] The ease with which they are constructed and applied has increased the use of space maintainers immeasurably even though the results obtained are not always perfect. By using these simply constructed appliances, however, dentists are able to do more good for more patients.

It is wondered what the chances are for the prevention or correction of malocclusion by simple remedial means in any given group of young children. Salzmann[2] cites the 1940 Guggenheim survey of 476 children, age two to nine and a half years, as follows: 50 per cent of the children had minor malocclusions, and 10 per cent had Angle Class II or other severe malocclusions. Forty-nine per cent of one or more posterior teeth had been extracted—usually the deciduous molars. About a third of the children under the age of seven with no extracted posterior teeth had malocclusions.

It is logical to assume, therefore, that a fairly large percentage of minor malocclusions can be corrected, and that such correction will prevent the development of malocclusions of a more severe character.

The prevention of malocclusion should be stressed among children of low income groups, to prevent the long-term, more expensive corrective treatment required by severe malocclusion.

SIMPLE SPACE MAINTAINER

Preventive orthodontics ranges from the insertion of a simple space maintainer by a general practitioner to limited therapy which will prevent the occurrence of

Professor of clinical orthodontics, Washington University School of Dentistry.

1. Willett, R. C. Relation of the general practitioner of dentistry to the orthodontist. J.A.D.A. 11:418 May 1924.

2. Salzmann, J. A. Principles of orthodontics. Philadelphia, J. B. Lippincott Co., 1943.

severe malocclusion. More often than not the orthodontist must perform the latter service, although many general practitioners are doing a commendable job in this respect.

A simple technic for the construction of a fixed space maintainer is as follows: A preformed chrome alloy molar band is fitted directly. A modeling compound impression is taken in a crown and bridge tray. The model is poured in hydrocal. Chrome alloy wire (.036) is fashioned with an extension for ease of handling. Soldering is done with 14 carat gold solder, using chrome alloy flux. The maintainer in construction is shown in Figure 1, above right.

PALATAL APPLIANCE

Malocclusions arising from bad habits rank next to those attributable to heredity in frequency of occurrence. The problem of thumbsucking has been approached from every conceivable angle. Generally, the pediatrician and the dentist do not agree whether the habit should be intercepted early, or whether it should be interfered with at all.

The thumbsucking habit has been eliminated by simple treatment in an exceedingly high percentage of instances (90 to 95 per cent). This result has been accomplished through the use of the following three methods, the last of which seems to be the most successful: (1) psychology; (2) applied medicaments and (3) appliances of the palatal crib type.

The palatal appliance must be allowed to remain in place for a period of at least six months to prevent the recurrence of the habit. Tongue-thrusting often is a sequel to the thumbsucking habit. If the palatal appliance (Fig. 1, center left and right) is allowed to remain in position for six months, the thrusting habit rarely is formed. The use of these appliances may be instituted safely as early as three years of age.

If the habit should persist, it may be

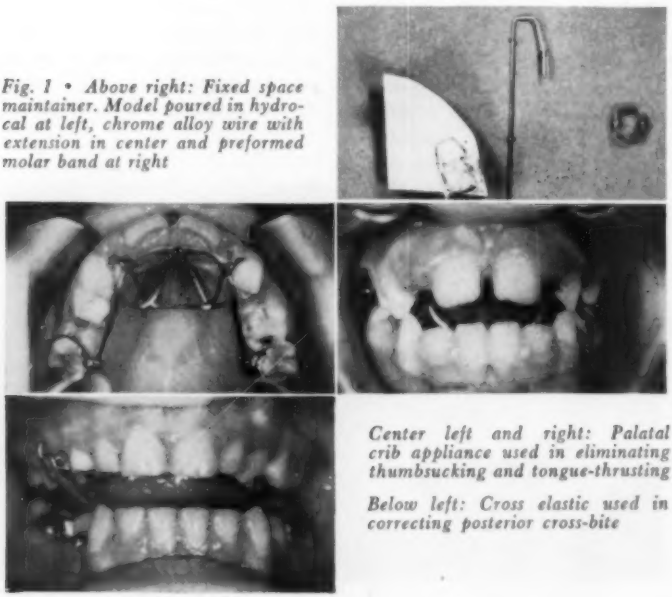

Fig. 1 • Above right: Fixed space maintainer. Model poured in hydrocal at left, chrome alloy wire with extension in center and preformed molar band at right

Center left and right: Palatal crib appliance used in eliminating thumbsucking and tongue-thrusting

Below left: Cross elastic used in correcting posterior cross-bite

advisable to allow the appliance to remain in place to absorb the pressure of the digit and to prevent further malformation of the maxillary alveolus.

Periodic inspection and maintenance of the appliance is all that is necessary in caring for the patients who are wearing them.

Perhaps a majority of the children treated by means of this type of appliance will need additional orthodontic attention. The period of treatment for such patients, however, invariably will be decreased perceptibly.

FIXED LINGUAL APPLIANCES

Other pressure habits may include leaning on the arm with the hand or fist resting on one particular portion of the face such as is done by some children when reading, sleeping, or watching television. As a result, an entire segment of teeth may be forced into a cross-bite condition.

Treatment of a cross-bite condition usually involves a fixed lingual appliance with an auxiliary spring producing a measured force against the malposed tooth or teeth. In some instances, a through-the-bite or cross elastic force (Fig. 1, below left) is necessary to correct the occlusion. These mechanotherapies must be supplemented by careful occlusal or incisal grinding of the offending teeth.

ACRYLIC RESIN SPLINT

An anterior cross-bite condition is often the result of the prolonged retention of the deciduous incisor teeth, resulting in a lingual eruption of the permanent incisors.

Acrylic resin splints cemented to the mandibular incisors have proved effective in the correction of anterior cross-bite conditions. This type of splint may be constructed directly on a model, using a self-curing acrylic resin, fashioned with an inclined plane which will strike the lingual surface of the maxillary tooth or teeth when the teeth are brought toward occlusion (Fig. 2).

The patient must not be allowed to wear the splint so long that it produces an open bite.

ACTIVATED SPACE MAINTAINER

Lack of space for the eruption of the second bicuspid is often the result of the premature loss of a deciduous molar which frequently permits the first bicuspid to drift distally. This condition can be corrected, and more pronounced mal-

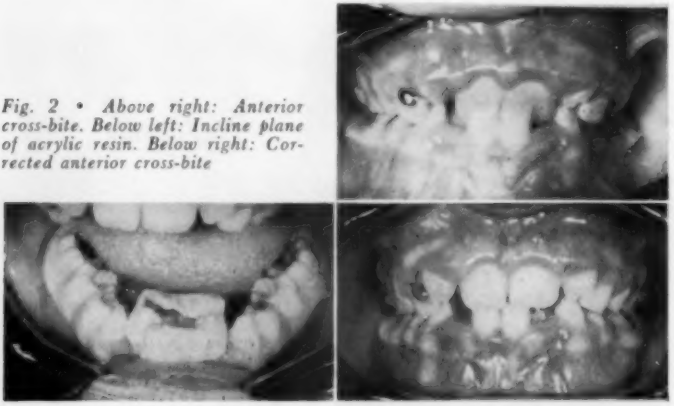

Fig. 2 • Above right: Anterior cross-bite. Below left: Incline plane of acrylic resin. Below right: Corrected anterior cross-bite

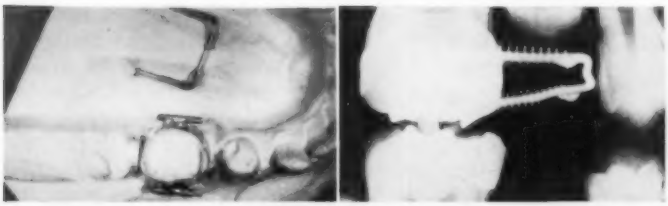

Fig. 3 • Left: Activated space maintainer used to prevent more pronounced malocclusion. Right: Activated space maintainer extended

occlusion can be prevented, by the use of a simple appliance termed the activated space maintainer (Fig. 3).

In making this appliance, an orthodontic band is adapted to the first permanent molar. A short horizontal tube, having an inside diameter of 0.036 inch, is soldered to the buccal and lingual surfaces of this band so that they are parallel to each other. A staple is formed from 0.036 inch round wire, and the free ends are fitted into the tubes so that the staple-shaped wire will slide freely against the first bicuspid. Two small metal stops are soldered on the anterior aspect of the staple wire. These stops serve as anchors for the coil springs. The coil springs (0.032 inch inside diameter) are threaded on the buccal and lingual arms of the staple wire. They are of sufficient length to allow compression when the appliance is cemented on the molar. When sufficient space has been obtained for the bicuspid to erupt, the springs may be removed and the staple wire soldered to the buccal and lingual tubes, to act as a fixed space maintainer until the bicuspid has erupted sufficiently to maintain its own space.

This appliance is effective in instances in which there has been no mesial drift of the molar and where there is sufficient room for mesial movement of the first bicuspid.

SOLDERED LINGUAL ARCH WIRE

One of the most effective bilateral fixed space maintainers, particularly in the mandibular arch, is an appliance consisting of a lingual arch wire soldered to bands cemented to the first permanent molars (Fig. 4). This simple appliance prevents mesial migration of the molars and distal and lingual movement of the anterior teeth.

ARCH WIRE WITH LOOP SPRINGS

The loss of an anterior tooth, with attendant shifting of the adjacent teeth into the space, may pose a problem in preventive orthodontics if the occlusion is normal and the labiolingual positioning of the remaining anterior teeth is correct.

An appliance (Fig. 5, left) effective in restoring mesiodistal space resulting from the loss of an anterior tooth may be constructed as follows.

The permanent first molars are banded and fitted with half-round vertical lingual tubes. A removable lingual arch is fashioned on a model supporting the bands.

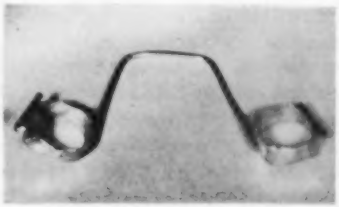

Fig. 4 • Soldered lingual arch wire for mandibular arch

On the anterior segment of the lingual arch, small, adjustable, auxiliary loop springs are attached with the free ends contacting the surfaces of the teeth adjacent to the space. Periodic adjustment will move these teeth into their original positions and provide room for the insertion of a replacement tooth anchored on an acrylic resin removable denture or some other type of suitable replacement (Fig. 5, right).

REMOVABLE SPACE MAINTAINER

The maintenance of space in those instances in which the premature loss of all the posterior teeth has occurred presents one of the greatest problems in preventive orthodontics—and one of the most difficult to manage. All too often the best of efforts to maintain space in such instances are totally ineffective. To be successful both vertical and horizontal dimensions must be maintained. Usually some form of partial denture is used in treating a condition of this kind.

The breakdown in the dental arch frequently occurs at an age when there are no suitable teeth erupted which may serve for retention. Although there are instances in which partial dentures are constructed without some form of retention, such appliances generally are not successful.

A bilateral removable space maintainer, constructed much as is a Hawley retainer, has proved most satisfactory in many such instances. A labial arch helps provide retention by its contact with the labial surface of the anterior teeth. The clasping of any available teeth, however temporary, may mean the difference between success and failure. Little concern need be felt regarding possible interference with the lateral growth of the arches in stabilizing these appliances, especially if the patient is four years old or older, as four-fifths of all lateral jaw growth has taken place by that time.[3]

The use of a Hawley retainer in minor orthodontics for the prevention of gross malocclusion may be relied on only when the progress and results of such treatment are satisfactory. Careful case analysis and administration of the tooth movement are necessary. Maintenance care on a regular prescribed basis is of utmost importance. Carelessness and lack of observation may result in tooth decalcification and soft tissue irritation far more harmful than the correction of slight malocclusion.

Too often the overuse of bite planes incorporated in palatal dentures has created open bites and dual bites, instead of preventing the malocclusion.

MYOFUNCTIONAL THERAPY

It is to be regretted that myofunctional therapy has not been used more widely in preventive orthodontics. Rogers[4] has long been a proponent of exercising the facial muscles to give them tone and to build up their natural firmness and elasticity. This practice eventually affects the use of the teeth, which, in turn, affects the alveolar process. Unfortunately, the effectiveness of this treatment is based on careful and persistent muscular exercise which also calls for time and cooperation. This last factor seems woefully lacking today in both patient and parent—and sometimes in the dentist himself.

SUMMARY

Preventive orthodontics is most effective when practiced not only by the orthodontist and the pedodontist but by the general practitioner as well. The prevention of malocclusion should be as im-

3. Graber, T. M. Appraisal of developmental deformities in cleft-palate and cleft-lip individuals. Quart. Bul., Northwestern Univ. M. School 23:153 Summer 1949.

4. Rogers, Alfred Paul. Coordinating natural and artificial methods of treatment. Internat. J. Orthodont. & Oral Surg. 10:63, 1924.

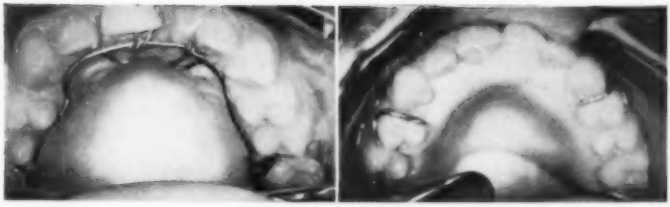

Fig. 5 • Left: Maxillary lingual arch wire with loop springs to secure space for replacement of upper central incisor. Right: Tooth replacement by means of palatal acrylic denture

portant to every member of the dental profession as is the conservation of each unit of the masticatory apparatus. Only the usual training received in an accredited dental school, plus the average amount of reading and attendance at dental meetings, is necessary to prepare the general practitioner for the practice of this extremely important phase of dentistry.

CONCLUSIONS

1. Preventive orthodontics, to be most effective, must be practiced by all dentists —orthodontists, pedodontists and general practitioners.

2. Modern dental education provides adequate instruction in preventive orthodontics.

3. Modern dental materials and technics provide new, simple means for the practice of preventive orthodontics.

4. The 1940 Guggenheim survey showed that 50 per cent of 476 children between the ages of two and nine and a half years had minor malocclusions, whereas only 10 per cent had severe malocclusions.

5. Children of low income groups particularly may be aided by preventive orthodontics. Interception of the malocclusions before they reach major proportions obviates long-term expensive treatment.

6. The interception and correction of bad oral habits is of utmost importance in the prevention of malocclusion.

7. The insertion of palatal crib appliances is effective in the treatment of thumbsucking and tongue-thrusting habits.

8. Anterior cross-bites may be corrected satisfactorily by the use of mandibular, anterior, self-curing acrylic resin splints.

9. Activated space maintainers are satisfactory for the correction of tooth positions in the bicuspid regions.

10. The soldered lingual arch wire is of value in maintaining space in instances of bilateral premature tooth loss.

11. Migration of anterior teeth, caused by tooth loss, may be corrected by means of a lingual arch wire supplied with loop auxiliary springs.

12. Effectiveness of tooth movement depends somewhat on available space into which the tooth may be moved.

13. Modified Hawley-type dentures may be employed for the maintenance of space, both horizontally and vertically, where premature loss of all posterior teeth has occurred.

14. Hawley dentures incorporating bite planes must be employed carefully to avoid creating open bites and dual bites.

15. All removable space maintainers and treatment appliances must be kept under close observation and carefully maintained to prevent tooth decalcification and gingival irritation.

16. Myofunctional therapy, a splendid aid in the development of normal occlusion, has not been practiced sufficiently by the dental profession.

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Prevalence of malocclusion in children six to fourteen years of age and treatment in preventable cases

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Malocclusion, an abnormality affecting a large group of the population, is an unsolved dental public health problem in most American communities.

Public health administrators have been hesitant to undertake treatment of dentofacial deformities in their dental departments because of the expense involved. They are interested, however, in a program which will stress the simplification of orthodontic treatment, making the procedure less costly and less time-consuming—one which will accomplish the most beneficial results for the greatest number of children.

A program involving preventive orthodontics seems to suit this demand. Consequently, a survey was undertaken in Newark, N. J., to determine the prevalence of preventable malocclusions and those that require correction. The preventable cases were treated to develop more rapid and efficient operative methods.

The investigator by means of the survey was able to accumulate quantitative data on the prevalence and incidence of malocclusions, while studying the prevention and control of these handicapping dentofacial deformities in the population. Ultimately, simplified technics of treatment were developed, based on public health orthodontic services rather than being based on ideal orthodontic treatment.

Orthodontics as a public health problem has been defined by the Children's Bureau of the Federal Security Agency[1] as follows:

> The correction of dentofacial deformities when efficiency of the dental mechanism is threatened by present or potential conditions which will cause tissue injury or interfere seriously with function or with mental or physical development.

The Newark dental public health program has as its goal the interception of malocclusions (preventive orthodontics)

Orthodontist, Bureau of Health, Dental Division, Newark.

1. Fulton, J. T. Suggested principles for public orthodontic programs for children. Am. J. Orthodont. 34:777 Sept. 1948.

and the dissemination of knowledge to the dental profession and laity to decrease the incidence of correctable malocclusions. The provision of early treatment to the affected children will remove interferences with their normal dentofacial growth and thereby enable them to achieve the best possible dental development and occlusion and more healthy personalities. Personality maladjustment caused by dentofacial disorders can be a serious problem in the child's future business and social life.

It is hoped that dental public health measures will decrease the need for extensive orthodontic treatment, which is an economic burden to a great portion of the population. This survey as well as other similar surveys clearly shows that far more children require orthodontic service than receive it—probably in most part for economic reasons.

METHOD

The Newark Bureau of Health study was based on the examination of 3,355 children 6 to 14 years of age in the school system of Newark, N. J. The children were seated in good light, and their mouths were examined with mouth mirrors and tongue blades.

Errors resulting from subjective judgment in classifications were minimized as only one examiner was employed. He had had graduate training in orthodontic diagnosis and was careful to employ a routine, standardized technic of examination.

A modification of Angle's classification[2] was used to categorize the occlusions of the children so that they could be readily analyzed, clinically and statistically. The children were classified according to the severity of the dentofacial deformity and possible clinical treatment. Had a more ideal epidemiological method of examination been employed, a greater number of persons would have been classified as having malocclusion; however, from a practical, public health treatment viewpoint[3] not all such instances of malocclusion would have been considered as clinical malocclusion.

The age range of 6 to 14 years was selected since it contains the greatest number of children with preventable orthodontic conditions.

The children examined represented no specific ethnic group and were an average sampling of the "melting pot" of Newark. The majority came from families in the low and lower-middle income brackets. The children's nutritional status was average and their dental status was poor.[4]

Angle's classification, with some modifications, was employed since it indicates a mode of treatment and is adapted to rapid surveying. The major categories are normal, Class 1, Class II (divisions 1 and 2 and subdivisions), and Class III. The children were further subdivided into two groups: those having preventable conditions and those with conditions requiring correction.

Preventable Malocclusion • Class I preventable and correctable, Class II preventable and correctable and Class III preventable and correctable indicate the classifications of malocclusions observed.

Children were diagnosed as having preventable orthodontic conditions if such conditions met the following clinical requirements:

1. Class I. Preventable malocclusion: anterior and posterior cross-bites and severe irregularities of the upper anterior region where sufficient spacing for correction existed.

2. Class II. Preventable malocclusion: severe protrusion of the upper anterior

2. Salzmann, J. A. Principles of orthodontics, ed. 2. Philadelphia, J. B. Lippincott Co., 1950, p. 481.

3. Pelton, W. J. Orthodontics from the public health viewpoint. Am. J. Orthodont. 40:27 Jan. 1954.

4. Newman, G. V. Eskimo's dentofacial complex. Effects of environmental and genetic factors. Am. J. Orthodont. 39:634 Aug. 1953.

Table • Prevalence of malocclusion in 3,355 children aged 6 to 14

Grade	Age in years	No. of children examined	Normal occlusion No.	%	Class I prevent. No.	%	Class I correct. No.	%	Class II prevent. No.	%	Class II correct. No.	%	Class III prevent. No.	%	Class III correct. No.	%
1	6	540	314	58.15	209	38.70			16	2.96			1	.19		
2	7	540	247	45.74	259	47.96			33	6.11			1	.19		
3	8	436	198	45.41	201	46.10	3	.69	30	6.88	4	.92				
4	9	433	199	45.96	160	36.95	18	4.16	37	8.55	17	3.92	1	.23	1	.23
5	10	417	190	45.56	85	20.38	62	14.87	21	5.04	56	13.43	2	.48	1	.24
6	11	383	185	48.31	18	4.70	102	26.63	8	2.09	67	17.49			3	.78
7	12	325	160	49.23	7	2.15	80	24.62	4	1.23	71	21.85			3	.92
8	13	281	119	42.35	5	1.78	74	26.33	2	.71	78	27.76			3	1.07
Total		3,355	1,612	48.05	944	28.14	339	10.10	151	4.50	293	8.73	5	.15	11	.33

teeth where there was adequate supporting bone in both jaws.

3. Class III. Preventable malocclusion: true Class III conditions and pseudo Class III conditions.

4. Malocclusion caused by or associated with bad habits such as thumbsucking, lip biting and tongue-thrusting.

5. Space resulting from premature loss of deciduous teeth, requiring space maintainers.

6. Malocclusion resulting from prolonged retention of deciduous teeth.

7. Malocclusion resulting from presence of supernumerary teeth.

8. Irritation of palatal tissues or the lower anterior gingiva resulting from deep anterior overbites.

Children with orthodontic conditions that would respond most readily to preventive treatment were in the mixed dentition age bracket. Treatment was of short duration (three weeks to one year). Preventive orthodontic treatment was started when it was determined that abnormal conditions in the mouth would not allow the inherent growth potential of the child to develop and when normal dentofacial development was lacking.

Correctable Malocclusion • Children were classified as having correctable malocclusion if their malocclusion was so advanced that the condition could not be helped by preventive treatment or self-correction and if the malocclusion required relatively continuous, prolonged treatment.

Children with missing first molars were classified as having correctable malocclusion since the correction of their condition would require extensive orthodontic treatment.

FINDINGS

Normal occlusion was found in 48 per cent of the 3,355 children examined (see table). Fifty-two per cent of the children examined, however, had some form of malocclusion and needed some form of treatment.

Class I preventable (28.14 per cent) and Class I correctable (10.1 per cent) were the most common forms of malocclusion observed. Class II preventable (4.5 per cent) and Class II correctable (8.73 per cent) were the next most prominent forms of malocclusion. The lowest percentages were found in Class III preventable (0.15 per cent) and Class III correctable (0.33 per cent) malocclusions.

A comparison of the data on Class I preventable malocclusion and Class I correctable malocclusion indicates that the percentages of both types of malocclusion are in inverse proportion to the

chronological age of the children involved; that is, there are more children with Class I preventable malocclusion in the younger (six to nine) age group than in the older (10 to 13) age group.

Conversely, in Class I correctable conditions there are fewer children in the younger (six to nine) age group than in the older (10 to 13) age group. The older the child with a malocclusion, the less probability there is for self-correction and preventive treatment and the greater the need for prolonged corrective treatment.

Similarly, there are more children in older age groups with Class II correctable malocclusion than in the younger age groups. In the group classified as having Class II preventable malocclusion, however, 2.96 per cent were age six; 6.6 per cent were in the 13 year old group.

This fluctuation can be explained as follows: Because of the metamorphosis from the deciduous dentition to the mixed dentition at age six, the examiner only categorized those children as possessing Class II malocclusion when the condition was severe enough to require clinical treatment.

The peak of Class II preventable malocclusion was reached at the age of nine, which is understandable, since at this age the child having Class II malocclusion is too young to receive corrective orthodontic treatment but not too young to receive preventive orthodontic care.

Although a smaller percentage of the total malocclusions constituted Class III cases, no preventable Class III cases were observed among children ten years of age or older. However, the incidence of Class III correctable malocclusion in that older age group increased.

Less than 1 per cent of the children examined were being treated or had been treated for orthodontic conditions.

A survey[5] of 119,000 school children in St. Louis showed that 51 per cent had dentofacial deformities of which 80 per cent might have been prevented.

A comparative review[6] of the literature based on various studies of the incidence of malocclusions reveals that approximately 50 per cent of the children in the United States suffer from dentofacial deformities.

TREATMENT PROCEDURES

Strang[7] states:

> . . . preventive orthodontia offers the only means whereby the great mass of humanity can be aided by our specialty, for corrective treatment is so exacting and of such long duration that the attendant expense makes it really a luxury in which only those above moderate circumstances can indulge.

The technics for preventive treatment described in this Newark study have been developed and selected on the basis of simplicity, effectiveness, rapidity of results and economy. The patients treated in the orthodontic department of the Newark Bureau of Health are screened for indigency.

Class I Preventable Malocclusion • Anterior and posterior cross-bite malocclusions are objectionable developmental conditions since they have a deleterious effect on the teeth and their surrounding structures, cause maldistribution of alveolar bone and may result in facial asymmetry.

Posterior cross-bite malocclusions are treated early since they are difficult to treat in the permanent dentition and if not corrected during the early stages usually result in facial asymmetry. The posterior cross-bite causes the maxillary dental arch to be constricted which prevents the mandible from adjusting itself to functional centric occlusion; therefore,

5. Brandhorst, O. W. Will orthodontics become part of contemplated government health programs for children? J. D. Educ. 10:135 Feb. 1946.

6. Massler, Maury, and Frankel, J. M. Prevalence of malocclusion in children aged 14 to 18 years. Am. J. Orthodont. 37:751 Oct. 1951.

7. Strang, R. H. W. Text-book of orthodontia, ed. 3. Philadelphia, Lea & Febiger, 1950, p. 348.

the patient shifts his jaw laterally to accommodate the occlusion.

By tipping the upper and lower first molars and employing cross-elastics, it was possible to alleviate most of the posterior cross-bite conditions and prevent severe malocclusions.

Figure 1, above left, illustrates a model of the teeth of a patient nine years of age with Class I preventable malocclusion. The upper left central incisor, lateral incisor, deciduous cuspid and molars are in linguoversion to their antagonists, causing a localized underdevelopment. The patient was treated with a lower acrylic resin incline plane for six weeks. The teeth were placed in normal functional relationship, resulting in better alveolar bone growth and better balance of environmental forces (Fig. 1, above right). This simple preventive orthodontic measure reduced an economic drain on the patient's family and prepared him psychologically for a happier life by improving his appearance and his dental health.

Class II Preventable Malocclusion • Figure 1, below center, shows an instance of Class II preventable malocclusion which was a psychologic and biologic handicap to the patient. The child was placed under treatment at age seven, primarily because he would not go to school since he was the object of ridicule by his schoolmates, who had cruelly called him "Bugs Bunny."

Other factors contributing to the necessity for early treatment of this child were the impingement of his lower anterior incisors into the soft palatal tissues, causing irritation, severe procumbency of the upper central incisors, which increased their chance for fracture, and poor lip muscle tonicity.

The patient was treated by means of cervical anchorage (cervical strap and face-bow) which he wore at night (Fig. 1, below left and right). During the day he wore a Hawley-type bite plate.

Cervical or occipital anchorage in instances of Class II preventable malocclusions retards the growth of the molar portion of the maxilla while the mandible grows downward and forward into normal relationship.

The bite plate promoted the correction of the deep overbite, unlocked the occlusion, allowed the mandible to grow downward and forward and was used to retract the anterior teeth. Furthermore, the anterior wire of the self-curing acrylic resin bite plate also acted as a splint to prevent fracture of the protruding anterior teeth.

Lip exercises also were given to develop proper muscle tonicity.

A secondary stage of corrective orthodontic treatment may be necessary. This simple, preventive orthodontic treatment however, not only reduces treatment time but aids the mental well-being of a child who has a handicapping dentofacial deformity.

Class III Preventable Malocclusions • The prognosis of those Class III malocclusions which must be correctively treated is usually poor; therefore, early treatment is advisable.

Figure 2 illustrates a Class III preventable malocclusion before and after treatment. The patient is an eight year old girl. Patients with pseudo Class III malocclusion can be treated with an acrylic resin incline plane in about four to six weeks. This patient, however, had a true Class III condition and required the employment of labiolingual appliances and Class III malocclusion mechanics.

Dentofacial Pressure Habits • Prevention of habits that create handicapping dentofacial habits is an integral part of preventive orthodontics.

Figure 3, left, depicts a deformity of the anterior portion of the mouth of a boy six years old who sucked his thumb. The patient's ego was appealed to unsuc-

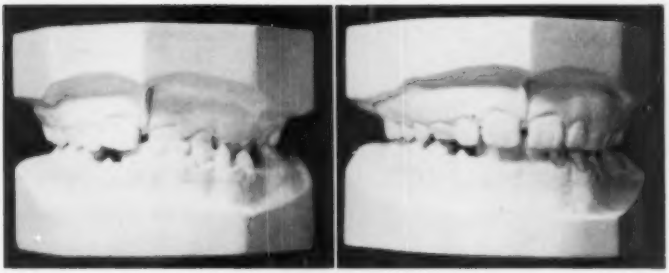
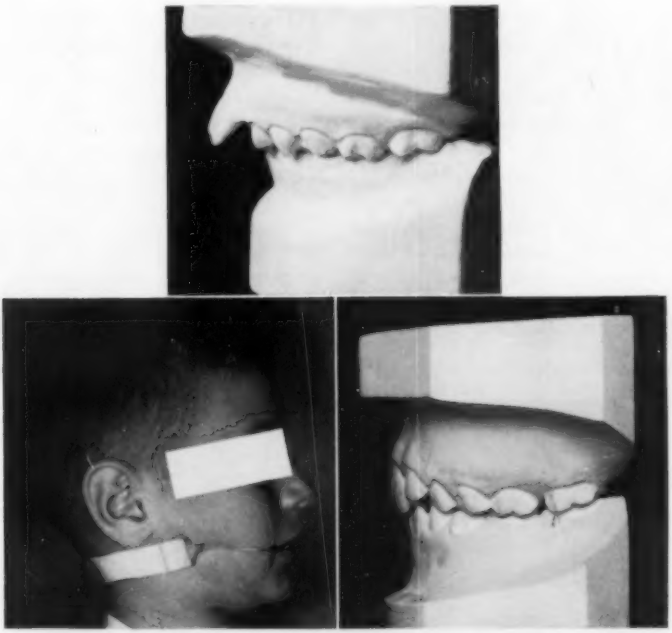


Fig. 1 • Class I preventable malocclusion. Left: Model of teeth of patient before treatment. Right: Model of teeth of patient after treatment



Class II preventable malocclusion. Center: Model of teeth of patient before treatment. Left: Cervical strap and face-bow appliance used in treatment. Right: Model of teeth of patient after treatment

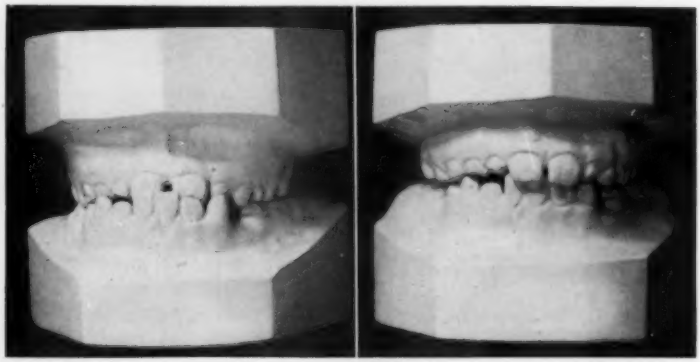


Fig. 2 • Class III preventable malocclusion condition before and after treatment with labiolingual appliances and mechanics

cessfully, although the psychologic approach has been successful in a small percentage of children who have had bad oral habits. The most effective technic in treating slowly-responding and uncooperative patients is the "hay rake." This appliance is made of stainless steel molar bands to which are soldered a .040 lingual arch. Dull points of .036 wire are soldered to the lingual arch as illustrated in Figure 3, center. This appliance enabled the boy to break his thumbsucking habit in six months (Fig. 3, right).

Tongue-thrusting habits are treated in a similar manner. Occasionally, stainless steel bands are constructed and cemented on the anterior teeth with the lingual flaps not folded down, leaving protruding points. These bands tend to discourage thumbsucking and tongue-thrusting habits.

Figure 4 portrays a removable bite plate with a grid which is used to break tongue-thrusting, nailbiting and thumbsucking habits in more cooperative children.

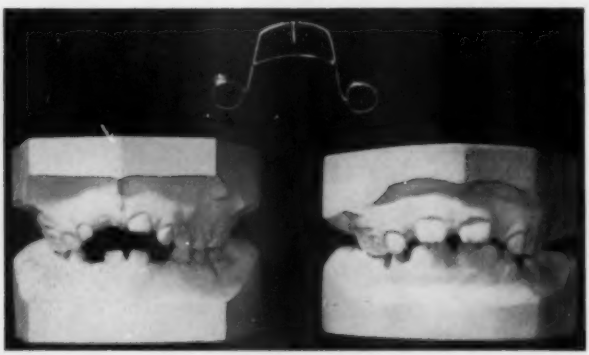


Fig. 3 • Models of mouth of thumbsucker before and after treatment and appliance employed to correct habit

Premature Loss of Deciduous Teeth • One of the causes of malocclusion is the premature loss of deciduous teeth. The deciduous teeth preserve the line of occlusion and the mesiodistal arrangement of the teeth.

Children under the age of ten suffering from bilateral loss of deciduous molars were given priority as far as public health preventive treatment was concerned.

Removable acrylic resin space maintainers with clasps were tried, but were found to be less successful than the Mershon lingual arch appliance shown in Figure 5.

The space maintainer is observed at intervals to be sure it is not interfering with the eruption of the child's permanent teeth. This fixed lingual arch appliance requires less adjustment than any other type of space maintainer employed.

To relieve crowding of the permanent incisors, the deciduous cuspids were extracted for some children in whom the combined mesiodistal widths of the deciduous cuspids and molars exceeded the widths of their permanent successors by at least 1.7 mm. on each side. In these instances a preventive lingual arch appliance was inserted.

The endodontist and pedodontist in the Newark Bureau of Health have aided in preventing malocclusions by restoring deciduous teeth that ordinarily might have been extracted, thereby maintaining the normal continuity of the dental arches.

The following example illustrates how space may be created for an unerupted bicuspid which has been slightly impacted because of the premature loss of a deciduous molar and the mesial drifting of the first permanent molar. It was assumed that the lower left second bicuspid was slightly impacted, and that space could be created to accommodate the bicuspid without causing the lower anterior teeth to shift off their basal arch support. A fixed soldered lingual arch appliance with edgewise brackets was cemented to the lower right second bicuspid and lower left first bicuspid, and a band with a rectangular buccal sheath was cemented on the lower left first molar. A push coil spring under tension was placed on a .020 round arch wire between the first molar and first bicuspid, and a space was created for the impacted bicuspid (Fig. 6, left).

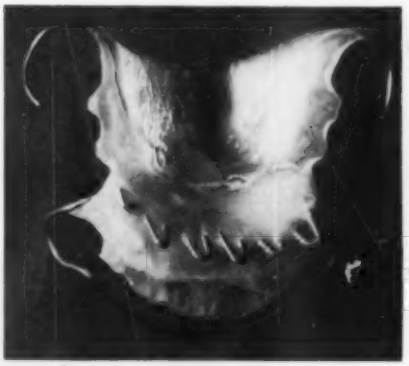


Fig. 4 • Bite plate used to break tongue-thrusting and thumbsucking habits

Prolonged Retention of Deciduous Teeth • An outstanding cause of malocclusion is prolonged retention of deciduous teeth. Figure 6, right, shows a permanent central incisor which is displaced labially because of the prolonged retention of a deciduous central incisor. The offending deciduous incisor was extracted, and the permanent central incisor was soon adjusted to normal alignment by normal lip pressure.

Discussion of Treatment • Preventive orthodontic treatment consists of the following: (1) the removal of factors which inhibit normal growth processes, (2) the prevention of malocclusion resulting from a disharmony between the eruption of the teeth and the growth of the jaws and (3) in instances of Class II and Class III preventable malocclusion, the readjust-

ment of the growth of parts that are inharmoniously interrelated.[8]

Another advantage of preventive orthodontic treatment, which usually is given during the mixed dentition period, that is, before the roots of the permanent teeth are fully formed, is the decreased root resorption evidenced after treatment. As Bercu Fischer[9] stated: "At this age tissue tolerance is at its maximum."

8. Newman, G. V. Effect of orthodontic appliances upon the mandible and temporomandibular articulation: pros and cons. Unpublished thesis. Graduate school of Medicine, school of orthodontics, University of Pennsylvania, Philadelphia, 1950.

9. Fischer, Bercu. Orthodontics. Philadelphia, W. B. Saunders Co., 1952, p. 5.

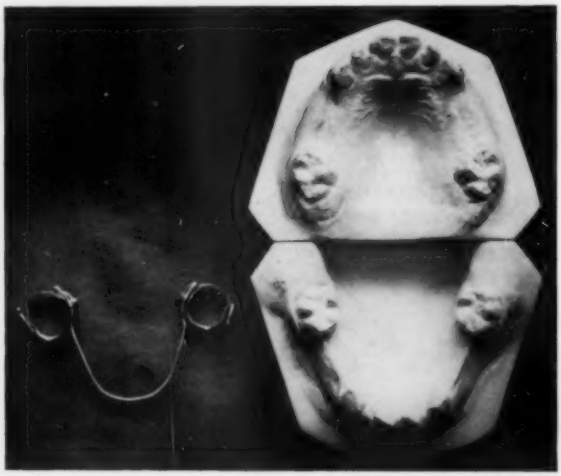


Fig. 5 • Mershon arch appliance used to preserve space resulting from premature loss of deciduous molars

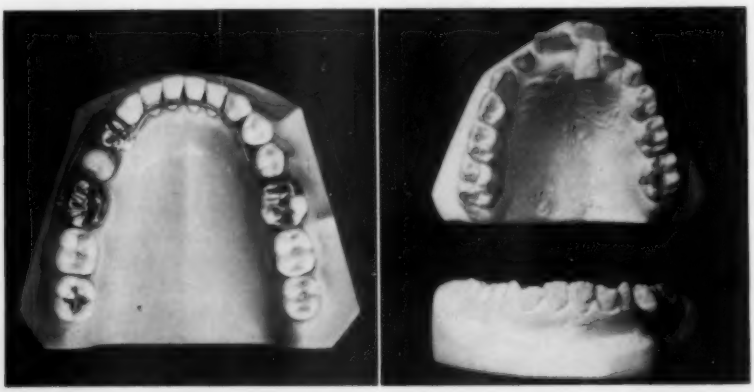


Fig. 6 • Left: Push-coil spring appliance used to create space for slightly impacted bicuspid. Right: Labially displaced permanent central incisor

SUMMARY

Malocclusions of the teeth, since they affect a large segment of the population, are a dental public health problem.

Consequently, a preventive orthodontic care program has been organized in the Newark Bureau of Health, Dental Division.

Data on the prevalence of preventively and correctively treatable malocclusions in a group of 3,355 children, 6 to 14 years of age, were accumulated and studied, and preventive orthodontic technics were applied to ascertain the most efficient, rapid and economic methods for treatment. The following observations were made:

1. Normal occlusion was found in 48 per cent of the children examined. Malocclusion was found in 52 per cent of the children.

2. Class I preventable malocclusion was found in 28.14 per cent of the children. Class I correctable malocclusion was found in 10.10 per cent.

3. Class II preventable malocclusion was found in 4.50 per cent of the patients. Class II correctable cases were found in 8.73 per cent.

4. Class III preventable malocclusion was found in 0.15 per cent of the children and Class III correctable malocclusions totaled 0.33 per cent.

5. Less than 1 per cent of the children examined had been treated or were receiving orthodontic treatment.

6. The statistical difference between boys and girls in the incidence of malocclusion was insignificant.

7. Preventive orthodontic treatment is not complete corrective treatment. Rather it fosters normal oral muscular function and adjustment of facial, skeletal and dental parts, permitting the development of a pleasing facial appearance and thereby preventing the psychologic maladjustment that usually occurs in a child with a handicapping malocclusion.

8. Public health preventive orthodontics furnished children from families in the lower income bracket will tend to diminish the severity and incidence of correctable malocclusion in family units least able to pay for such corrections.

The author would like to quote from an article by Strusser and Simon[10] of the New York City Department of Health, orthodontia department:

> It follows that if a program is geared to prevent major handicaps, not only are the children aided thereby but countless thousands of dollars can be saved later . . . In conclusion, programs cannot always be evaluated in costs. In our economy, where the dignity of man is paramount, where everyone regardless of race, creed, color, or station in life should have equal opportunities for life and contentment, the money here spent is by far the finest investment for the tax dollar.

10. Strusser, Harry, and Simon, Louis, Orthodontics in public health practice. (Oral Rehabilitation Program, New York City.) Am. J. Orthodont. 40:654 Sept. 1954.

The Middle Ages • There were perhaps as many men of genius in the Middle Ages as now. . . . If these mediaeval scientists did not always make a good showing, we may ask ourselves what men like Gauss, Faraday, or Claude Bernard would have done if they had been born in the eighth or ninth century instead of being able to take advantage of another millennium of human effort? *George Sarton, Introduction to the History of Science.*

Masticatory insufficiency and its relation to systemic disease

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This study and its observations point out the necessity for a better understanding of the prosthodontic problem, and present a hypothesis hitherto largely unexplored.

The purpose of this discussion is twofold: First to consider what knowledge is necessary to institute prosthodontic treatment, and secondly, to analyze the importance of such treatment in the maintenance of health and the prolongation of life.

DIAGNOSIS AND TREATMENT PLANNING

To look into a mouth, to see teeth missing and to decide to restore these by either complete or partial dentures, are elementary steps. To produce a complete or partial denture for this mouth is also elementary. Diagnosis and treatment planning, however, are of primary importance. Without a consideration of all factors in making a diagnosis, planning and treatment become a speculative enterprise.

The author in recent years has had occasion to observe hundreds of young dentists at work. Included were graduates of almost every dental school in the nation. In the field of prosthodontics, these young dentists uniformly neglected diagnosis. They failed to consider the relation of the oral cavity to the rest of the body.

No division of dentistry is more concerned with the over-all health of the patient than is prosthodontics. Planning cannot succeed without a full investigation of the physiologic and psychologic condition of the patient, with subsequent establishment of mutual responsibilities and an understanding by the patient of the limitations of treatment.

Many dentists are not mechanically inclined, and delegate much of the prosthetic procedure to a laboratory technician. It is not essential for the dentist to be involved in the actual manufacture of a prosthetic appliance, but it is absolutely essential that he have sufficient knowledge of what is required to write the prescription for the laboratory. The finished product can then be delivered to the patient with the assurance that it embodies the dentist's understanding of the whole problem with its ramifications, biologic and mechanical. A prosthetic appliance without such a prescription is merely the figment of the imagination of a skilled technician who is unconcerned with the patient's age, sex, state of health, or with any physiologic or

The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

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psychologic abnormalities that are part of the diagnostic picture.

UNDERGRADUATE EDUCATION

Clyde H. Schuyler, in his introduction to the third edition of *Complete Dentures* by Merrill Swenson, said:

> Dr. Swenson for many years has been a strong advocate of the allotment of more time for the teaching of dental prosthesis in dental schools. Through scientific research relative to the preservation of our natural teeth, dental prosthesis may become less essential. Until such a time, due to the complexities in acquiring competence to render this service, it merits emphasis and teaching time equivalent to that given operative dentistry in undergraduate teaching.

Many educators have urged that prosthodontics be given equal status with operative dentistry in the college curriculum.

The author watched men coming into the military service who had been born in the 1930's; among them were thousands of dental cripples with mouths void of any semblance of dental care, and many without hope for rehabilitation other than the construction of complete upper and lower dentures.

The most disturbing revelation was the dentists' inability to cope with what they saw. All were recent graduates of accredited dental schools, yet they lacked a knowledge of diagnosis and treatment planning in prosthodontics, and were unable to cope with the problems presented. By comparison, operative dentistry was executed without apparent difficulty.

As the dental problems of young men inducted into military service are studied, it is realized that dentists have failed to educate these youths to the necessity of dental health care.

PROSTHODONTICS AND FOCAL INFECTION

It is difficult for a dentist to convince a boy in his teens or early twenties that unless his mouth is taken care of and maintained in maximum oral health, he may in later life be subject to digestive disturbances, gastrointestinal disorders, circulatory and organic impairment, and tissue derangement which may result from these metabolic disturbances and may culminate in some type of incurable malignancy.

Is it not possible that the interpretation of foci of infection of dental origin has been rather ambiguous? It has been taught that a focus of infection is a bacterial entity which may be responsible directly for, or contribute to, the symptoms or manifestations of the disease, such as abscessed or nonvital teeth, periodontal disease and so forth. Could it not be a functional breakdown of the dental apparatus that may be the focal point of disturbance? What has happened to the growth, development, nourishment and maintenance of other parts of the body during the years when a most important portion of it, the oral cavity, was being disrupted? Is it not possible that in the failure of good function of the masticatory mechanism, the other organs failed to receive their rightful nourishment and their cycle of function may have been impaired?

As man grows older his functions are diminished. It may be that a diminished dental masticatory function can impair a heart, a kidney, a digestive system, gradually, slowly, for months and years, until all normal functional resistance to metabolic breakdown ceases and significant pathologic manifestations appear. Heroically, the dentist attempts to institute treatment, but his efforts often are in vain because of insurmountable obstacles which have accumulated during the life of the patient.

OBSERVATIONS

Preventive dentistry recognizes the necessity to maintain the child's oral health. It is well known that some childhood dis-

eases manifest themselves in the mouth; fevers, for instance, may arrest the tooth development and the structural formation. Metabolic dysfunctions may also interrupt skeletal growth and body contour. Is it not plausible that any organic dysfunction in any part of the body may manifest itself, perhaps years later, in some other remote part of the body? Is it not possible that a masticatory disturbance in youth may result, late in life, in carcinoma of the abdomen?

For almost two years the author compiled data relating to the hypothesis that many diseases may arise from dental foci which may have had their origin at an early period in life.

Observations were made on 117 patients given dental examinations at the hospital tumor board conference. Four of the patients were between the ages 19 to 25, 19 were between 25 to 35 and ninety-four of the patients were between the ages of 35 to 62. Less than 1 per cent of the patients examined had oral cancer. The remainder had malignancies of other parts of the body.

The status of the existing dental restorations was important. It reflected the efficiency of the masticatory mechanism of the patient. A well-fitted prosthetic appliance, healthy surrounding tissues and a functioning occlusion were simple criteria for an acceptable prosthesis. Many an appliance that was judged unacceptable was held in high regard by the patient. The normally tolerant person accepts his lot and assumes that all is well. Actually, he may be substituting his efficiency level for his tolerance level.

It is in this period of inefficient functioning of the prosthesis that much disorder can result. Food that cannot be masticated properly either is not eaten or is swallowed with the hope that the gastric juices will finish the job. Gastric disturbances follow. Multiply this procedure through years of indiscriminate abuse, and the result may be disease.

The necessity for a prosthesis appeared in each of the 117 patients examined. The loss of even a single tooth, if it is not replaced, will disrupt the mechanism of mastication. Patients reported that from 1 to 14 years had elapsed from the extraction of the first tooth to its replacement; the mean for all patients was about three years. With the exception of an anterior replacement, the replacement of teeth was considered by none of the patients to be absolutely essential to his well-being, until it became too difficult to masticate his food. Even this eventuality did not disturb some, as evidenced by the number of edentulous patients in the group who had never had dentures constructed. Of 43 edentulous patients, 12 were without dentures, three reported they could not wear dentures, and seven wore only upper dentures.

The remainder of the 117 patients had missing teeth. These 74 patients required 146 replacements, which ranged from one tooth to a complete upper denture. Of these 74 patients, three had complete dentures, 21 had partial dentures and 50 were without dentures; 146 replacements were necessary, and the number of teeth requiring replacements in order to restore functional occlusion was as high as 1,258.

There was no direct evidence that the character of the dentition, or the lack of dental work was responsible for the presence of the prevailing disease. Some people appear able to attain a full span of life without ever submitting to any type of dental health care or oral hygiene.

What remains in the memory are the mouths of the boys born in the 1930's. The question of the general health of these men 10 or 20 years from now arises. It is wondered whether they, too, will be the victims of some organic dysfunction whose cause may well have stemmed from the primary disruption of their masticatory mechanisms and whether they will be the future patients to be presented to tumor board conferences.

SUMMARY AND CONCLUSIONS

1. The masses of people have not been educated to understand that diminished function of any part of the body may be reflected in the health of the entire body. Impairment of the masticatory mechanism may eventually take its toll systemically. Until the public recognizes this possibility, prosthodontics will not be accepted as a definite health service.

2. Dental educators must interest themselves in this problem. Time comparable to that given the study of operative dentistry must be devoted to the undergraduate study of prosthodontics. Prosthodontics covers greater areas of dentistry and medicine than does any other special branch.

3. Dental caries remains as great an enigma to dentistry as does the common cold to medicine. Although tremendous strides have been made toward solving this disease, prosthodontic treatment will continue to be necessary for a masticatory insufficiency created by dental disease.

4. Foci of infection of dental origin must be recognized as a functional, as well as a bacterial, entity. Routine replacement of teeth that are lost must be declared as essential to the maintenance of health as the necessity to restore carious teeth, to preclude the possibility of impairing the efficiency of each working part of the body. Such therapy will help maintain a normal metabolism and a physiologic balance to insure a healthy and satisfying span of life.

Prosthodontic treatment is required for all ages, and the public must be educated to recognize it as a necessary factor in maintaining health.

To rehabilitate a mouth without considering the over-all systemic value of such treatment is a meaningless gesture. Only a well-planned diagnostic approach and an intelligent and correlated plan of treatment, with establishment of definite responsibilities and limitations for both patient and dentist, in consonance with the diagnosis, can create a functional substitute for a masticatory apparatus impaired by oral disease. Such a procedure will come to be recognized as necessary in the maintenance of health and the prolonging of life.

Herophilus the Anatomist • Herophilus was the first to teach that the brain and not the heart is the site of thought and intelligence. He also was the first person known to perform postmortem examinations. He already differentiated between nerves and blood vessels and called the pulmonary artery the "arterious vein." Herophilus carefully observed the pulse and grasped its significance as a gauge for health and disease. Counting its rate by a clepsydra [water clock], he commented on systolic and diastolic phases and taught that the pulse had four cardinal characteristics: frequency, rhythm, size, and strength. Also, he described a peculiar pulse which he designated "pulsus caprizans," in which there was an initial stroke believed to result from only partial dilatation of the artery, immediately followed by a more forcible one. His term "goat leap pulse" survives in modern medicine. According to Herophilus, to detect the pulse's exact harmony in relation to age and disease, one needs to be a musician or even a mathematician. *Pliny (23-79).*

The dentist and his assistant

Philip W. Card, D.M.D., West Somerville, Mass.

Much has been written about the responsibilities and duties of the dental assistant in the modern office. Most of the material emphasizes her role as that of an auxiliary and does not recognize her as one who could become a much more valuable individual than she is in many dental offices. It is the dental assistant who comes in closest contact with the dentist, with his work and with his patients. The hygienist has her own world of professional activity. The secretary-receptionist presides over the front of the office. The technician works in his laboratory behind the scenes. It is the assistant who is constantly by the side of the dentist and who is on the "firing line" every minute.

Today the dentist is recognized as a most important worker in the field of medical science. The status of the dental assistant, too, has changed from that of ill-trained, part-time worker to an efficient, full-time associate who, in the leading offices of the country, proudly wears her pin of certification. No dentist can render maximum service to his patients when he works alone. The day is long since past when he can essay the role of dentist, assistant, secretary, bookkeeper and technician, if he is to conduct his practice efficiently.

ADVANTAGES OF USING DENTAL ASSISTANTS

In a survey of personnel shortages conducted in 1944, Klein[1] estimated that a dentist working alone could treat about 39 patients a week, but with one assistant at the chair, he could treat about 53 patients in the same period. In another survey made by the American Dental Association in 1950,[2] it was found that "those dentists employing one auxiliary averaged 37 per cent more patients than those without, while those employing two auxiliaries averaged 69 per cent more patients. The Workshop at the University of Michigan, while studying the organization of private practice in 1953, pointed out that "an assistant will conserve the dentist's productive time and enable him to provide more thorough dental care for more people."[3]

These statistics indicate clearly that the dental assistant is an important factor in the extension of the vital health service which the dentist renders. They also suggest, especially to the younger dentist, that it is much more inefficient for him to be without an assistant than to employ one. Although it is understandable that a young man might hesitate to employ an assistant in his first few years of practice, he should, nevertheless, carefully consider the advantages to be gained by so doing. At the University of Michigan Workshop it was pointed out that "it is the lack of comprehension of the advantages to be

1. Klein, Henry. Civilian dentistry in wartime. J.A.D.A. 31:648 May 1, 1944.

2. American Dental Association, Bureau of Economic Research and Statistics. Nineteen-fifty survey of the dental profession. III. The dentist's work week. J.A.D.A. 41:505 Oct. 1950.

3. Evaluating committee reports. Workshop to study the organization of scientific dental health service to more people, Sept. 6-12, 1953, Ann Arbor, Mich., University of Michigan, 1954, p. 82.

gained from the effective utilization of auxiliary personnel"[4] that deters many dentists from hiring an assistant. What are these advantages? First and foremost, a properly trained assistant will reduce greatly the dentist's mental and physical strain. Second, she will add prestige, dignity and a more professional atmosphere to his office. Third, she will improve the orderliness of his working hours and systematize his office routine. Fourth, she will minimize the danger of legal entanglements. Fifth, she furnishes an additional contact in the building of his practice. There are four disadvantages which come to the mind of many men when they consider this problem: (1) the expense involved, (2) the period of training necessary to change a raw recruit into an efficient helper, (3) the possible waste of time if the assistant seeks another position, (4) the possibility of personality conflicts.

Of all the disadvantages, possibly the one that seems greatest to many men is the additional expense. A thoughtful appraisal of the situation, however, shows this to be largely a matter of perspective. For example, there was a time, not too far back in dental history, when a young man starting out in practice felt that he could not afford the purchase of x-ray equipment. He felt that it was only being "realistic" to dispense with this luxury until he was "on his feet." But today, no farsighted young man would attempt the practice of dentistry without an x-ray machine. Yet the number of professional failures has not increased perceptibly because of this addition to the budget. With an increasing demand being made on the dental profession and the lack of skilled professional workers, it is not too impractical to prophesy that the time will come when no dentist would think of practicing without an assistant. The stature of a man or a profession always increases in direct proportion to the responsibilities assumed.

Emphasis must be placed on the fact that dental assistants of high caliber do not come "ready made." They must be trained to suit the requirements of the individual dentist. But dentists themselves are extremely individualistic by the very nature of their calling, and many men feel that it is a distinct advantage to mold and train a young recruit to their own particular method of practice. It is always easier to teach a routine for the first time than it is to change the habits learned in other offices.

Many dentists fear that after spending time and money in the education of an assistant, she might leave them for employment elsewhere. It should be pointed out, however, that people who are made to feel that they hold a position of responsibility, trust and prestige—and every dental assistant should fall into this category—do not readily forfeit those positions unless forced to do so by circumstances beyond their control. The possibility of termination always exists, of course, but good working conditions, a salary commensurate with ability, assurance of further advancement as she becomes more and more proficient, tact and consideration as she is directed in her daily duties, all combine to form a firm partnership between dentist and assistant which is not easily dissolved.

SELECTION OF ASSISTANT

It is of the utmost importance that the dentist select an assistant whose personality is in accord with his. Discord in the office is bound to be sensed by the public and reacts against the dentist more than against his assistant. A dentist who is scrupulously fair, tactful and considerate of his assistant soon becomes her idol; an assistant with a warm personality and a cooperative attitude toward her work quickly becomes indispensable. The

4. Evaluating committee reports. Workshop to study the organization of scientific dental health service to more people, Sept. 6-12, 1953, Ann Arbor, Mich., University of Michigan, 1954, p. 84.

Golden Rule is as applicable in the dental office as anywhere else.

The selection of an assistant is a matter of utmost importance, for a mistake in judgment can be extremely exasperating and expensive. The character, physical qualifications and the mental ability of an applicant should be considered carefully. The dentist must have a solid foundation of character on which to build or his efforts will be wasted. References from previous employers, the clergy or school authorities are helpful, but the best clues to character come from the attitude and appearance of the applicant herself. It is undeniably true that a person's philosophy, attitudes toward life, and thinking are indelibly stamped on his face for all to read if they but take the time. Too eager interest in hours and wages, evasion of direct questions, obviously glib answers, reluctance to look one in the face and a tendency to flatter or whine—any of these characteristics are easily detected and should be warning signals to the alert dentist at the first interview. It is admittedly not an easy task to obtain a "jewel" of an assistant, but without becoming discouraged, disillusioned or disgusted the dentist must press the search until he has found her. C. Edmund Kells,[5] in his incomparable section, "Jambalaya," "reckons he must have seen a million of them!"

The word "assistant" is derived from the Latin verb *assistere*, meaning to stand by. "Standing by" at the chair can be gruelling work demanding stamina of the highest sort. It goes without saying, therefore, that the physical qualifications of the prospective assistant should be given considerable attention. No applicant is admitted for training in the nursing schools of any of our hospitals until her health record is clearly established. The dentist should be just as particular. Neatness of appearance, age, poise, pitch of voice and personality should be considered. The Workshop at the University of Michigan[3] suggested 18 as the minimum age for a chairside assistant. Regardless of the actual age, any applicant should be mature in thought and action. Clothes which are obviously extreme in style, a Hollywood make-up, a high-pitched strident voice and indifference of attitude clearly mark any applicant as unfitted for dental assisting. Attention to these details means the difference between an ideal assistant and one who is only mediocre.

No less important are the candidate's mental qualities. A mentally alert assistant who is able to think for herself and in an emergency to act quickly—one who can concentrate on a piece of work for more than a few minutes at a time—is an extremely valuable person with whom to work. This phase of a candidate's qualifications should be considered with caution, for not every person has the mental capacity to become a dental assistant. An inept worker at the chair will sap the energy, waste the time and fray the nerves of her employer. This is not to say that an assistant must be Phi Beta Kappa material, but she should have plenty of common sense.

Once an assistant has been decided on, the general policies of the office should be explained to her. Wages, hours, sick leave, vacation times, the number of uniforms to be worn during the week, coffee breaks, use of the office phone and a host of other details should be discussed and thoroughly understood. It will be found that the time taken to discuss these things at the outset will be more than repaid in offsetting irritation and embarrassment later on.

The first week of employment is a difficult time for both parties and both should approach it with the utmost in understanding and cooperation. The assistant must expect to receive careful supervision in the fulfillment of her duties. The dentist should understand that the initial

5. Kells, C. Edmund. The dentist's own book. St. Louis, C. V. Mosby Co., 1925, p. 286.

association with his "new girl" is a period in which he should show patience, consideration and helpfulness. A few words of encouragement at just the right time will pay heavy dividends in gratitude and future loyalty on the part of the dental assistant.

Although it is possible to train an assistant and accustom her to the routine of the office in a relatively short time, she will never reach the ultimate in efficiency, any more than her doctor will attain the zenith of perfection in his professional career. She should rightfully expect to play a much more important role than that of housekeeper in the office, and the efficient utilization of her services spells the difference between success and failure in many offices.

Service at the chair should exclude duties as secretary or bookkeeper, for such a procedure is both inefficient and costly. No one person can properly perform all functions in a modern practice. Too many dentists fail to realize that assisting at the chair will be haphazard and disjointed if one assistant is required to answer the telephone, receipt bills, make appointments and perform other duties which take her away from the chair. Yet that is the very place where she should be of the most value to the dentist. Everyone has his own sphere of competence, and that of the assistant should be at the side of the dentist and not at the front desk.

The assistant should be encouraged to take the certification course which is offered in many cities. She should join and actively participate in the local assistants' association. She should go with her doctor to the state and national meetings. Professional literature should be made available to her for study. Through these and other activities she will develop an *esprit de corps* and will be made to feel that she has a definite place and function in the exciting new world to which she now belongs.

COMMENT

The problem of good assistantship is second to none in the efficiently conducted dental practice. It deserves considerably more thought and attention than the average dentist gives it. Success in teamwork of any kind requires the full cooperation of each member, and since the dentist has the largest interest at stake, he has the largest responsibility in establishing a firm bond between his assistant and himself. His efforts are well rewarded, however, for the ideal assistant is the cornerstone of the dental office. She is seriously interested in her career. She takes the deepest interest in the welfare of her employer and his patients. She has a happy attitude toward her work. She is loyal to the core. By her alertness in thought and action, her never flagging interest in the daily routine and by her general air of cheerful competence, she has become an institution in the dental world.

120 College Avenue

Science and the Future • It is imperative that laymen grasp clearly the accomplishments of science in this century, which are certain radically to affect man's future life on earth. *Dwight D. Eisenhower.*

Resin cements and posterior-type direct filling resins

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Dentistry has long awaited the development of a cement with such superior properties that it would displace zinc phosphate cement. Since 1952 some synthetic resin cements have been available commercially for dental use, but little informative literature about them is available. It is the purpose of this report to supply some data on the physical and chemical properties by which these resin cements may be compared with each other and with zinc phosphate cements.

MATERIALS INVESTIGATED

The materials surveyed are listed in Table 1 according to type, batch or control numbers of the manufacturer and date of procurement. Standard deviations are given in the tables presenting test results if more than two specimens were tested. Otherwise the data are the average of duplicate tests.

COMPOSITION

Powder • The proportion of organic and inorganic constituents of the powders was determined quantitatively (Table 2) by extraction with chloroform. The resins in P.F. and Replica powders would not dissolve in chloroform; hence, these two resins are omitted from Table 2. The resins were not identified. The chloroform-insoluble portions of the powders referred to in Table 2 did not contain organic materials (as no charring occurred on heating) and were, therefore, considered inorganic. Some of these inorganic fillers were identified by spectrographic, petrographic and roentgen ray diffraction analyses (Table 3).

Liquid • The refractive indexes of the various resin liquids ranged from 1.413 to 1.424 at 25°C. The index of refraction of methyl methacrylate monomer is 1.412 at 25°C. The density of the liquids ranged from 0.938 to 0.944 Gm. per milliliter at 25°C. The density of methyl methacrylate monomer is 0.938 at 25°C. The liquids had an odor characteristic of methyl methacrylate monomer but no chemical identification was attempted. All of the monomers except P.F. and Replica were apparently free of cross-linking agents, as all of the powders and all of the hardened resins except P.F. and Replica dissolved in chloroform.

Cement • The water-soluble arsenic content of all of the resins was determined by the modified Gutzeit method.[1] The

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1. Hillebrand, W. F., and others. Applied inorganic analysis, ed. 2. New York, John Wiley & Sons, 1953, p. 269.

Table 1 • Resins investigated

Material	Manufacturer	Date procured	Color	Batch numbers		
				Powder		Liquid
Resin cements						
Acrynamel	American Consolidated Dental Co.	Dec. 1953	translucent cream & gray, white	none		none
Dura	Reliance Dental Mfg. Co.	Nov. 1953	cream, gray, white, yellow	3EW 3GX	3KR 3JY 3UR	ICB ICU KCA
Grip	The L. D. Caulk Co.	Feb. 1954	gold, gray, ivory, pearl	929 B929 B3-4928	B33228 33728 34928	729
Justi	H. D. Justi & Son, Inc.	Apr. 1954	brown, natural gray & yellow, pink, white	454-A 454-B 454-C 454-D	454G 4-54E 554B 5-54D	354-A
Smith's	Lee Smith Co.	Mar. 1953	brown, gray, white, yellow	253E 253F 253G 253H 553C	6780 6781 6782 6783	7 92-104 9297
Surgident	Surgident, Ltd.	Oct. 1953	dk. & lt. brown, lt. gray & yellow, white	none		103
Tyton	Lang Dental Mfg. Co.	Dec. 1953	gray, lt. yellow, white, yellow	none		none
Vitacril	Fricke Dental Mfg. Co.	Dec. 1953	brown, cream, gray, white	none		none
Anterior-type direct filling resins						
Replica*	Cosmos Dental Products, Inc.	Apr. 1954	shades 18, 22, 34, 67	R-17 11-121	150931 200521	070731 171231
Posterior-type direct filling resins						
Dura Kore	Reliance Dental Mfg. Co.	May-Nov. 1953	black, copper, incisal white, lt. brown, & yellow, pale yellow, snowwhite	3EO 3EP 3ES 3ET 3EU 3EV	3FO 3FP 3FS 3FT 3FU 3FV	 DKE FKD FKE
P.F.	American Consolidated Dental Co.	Dec. 1953	gingival dk., gingival lt., gingival med., occlusal gray, occlusal translucent, occlusal white	none		none

*Because the manufacturer also recommends Replica as a resin cement, it is included in this investigation. In succeeding tables Replica is classed as a cement.

Table 2 • Proportion of inorganic and organic constituents of resin powders

Type	Material	Chloroform soluble (organic)	Chloroform insoluble (inorganic)
		% by wt.	% by wt.
Resin cements	Acrynamel	50	50
	Dura	41	59
	Grip	33	67
	Justi	73	27
	Smith's	42	58
	Surgident	75	25
	Tyton	41	59
	Vitacril	95	5
Posterior-type direct filling resins	Dura Kore	41	59

specimens were prepared according to the method outlined in the American Dental Association Specification No. 9 for Dental Silicate Cement[2] except that the resin specimen was not powdered. Instead, films of resin approximately 300 microns thick were used. All of the resins were within the maximum permissible limit of 0.0002 per cent (2 parts per million) of arsenic[2,3] required by the silicate cement and zinc phosphate cement specifications.

CONSISTENCY OF MIXED UNSET RESIN CEMENT

The method for determining the consistency of the unset cement was patterned after those in the American Dental Association specifications for silicate cement[2] and zinc phosphate cement.[3]

Apparatus • A diagram of the apparatus used in determining the consistency is shown in Figure 1. The glass measuring tube (A) is employed in the test for consistency for silicate cements. The method of forming the disk (B) is used in the test for consistency of zinc phosphate cements.

Method • The following technic was used in preparing all specimens unless otherwise stated. The resin powder was placed in a heap on one end of a glass slab (5 in. wide, 6 in. long and 1 in. thick). A crater was made in the powder with a flexible stainless steel spatula (S.S. White no. 324). Then 0.5 ml. of monomer was ejected into the crater in five seconds with a luer-type, tuberculin, hypodermic syringe having a capacity of 1 ml. The monomer was allowed to soak into the powder for five seconds, after which the mixture was spatulated vigorously for 20 seconds, using approximately 1 square inch of the surface of the mixing slab in order to obtain as homogeneous a mixture as possible. The glass measuring tube (A in Fig. 1) was then slightly overfilled with the mix and struck off flush on the end of the tube with the spatula.

These operations were completed in 20 seconds, after which 0.5 ml. of the mix was ejected on the glass slab in 10 seconds. Fifteen seconds later the glass plate weighing approximately 20 ± 2 Gm. and the 100 Gm. weight (total weight, 120 Gm.) were placed on the cement as shown in B, Figure 1. The weight was removed ten minutes after the mixing was started. The average of the major and minor diameters of three disks was recorded to the nearest 0.5 mm. The tests were conducted at 21°C. (70°F.) and at a relative humidity of 60 ± 10 per cent.

Test Results • The diameter of the disk is a measure of the consistency of the resin under test conditions. The effect of powder-liquid ratio on consistency is

2. Paffenbarger, G. C., and others. American Dental Association specification no. 9 for dental silicate cement (first revision effective—July 1, 1950). J.A.D.A. 40:186 Feb. 1950.

3. Paffenbarger, G. C., and Beall, J. R. American Dental Association specification no. 8 for dental zinc phosphate cement (first revision effective July 1, 1938). J.A.D.A. & D. Cosmos 24:2019 Dec. 1937.

shown in Figure 2. In a former investigation of the zinc phosphate cements,[4] a consistency that produced a disk 30 mm. in diameter was the average cementing consistency preferred by dentists. With the exception of Justi, Tyton, Vitacril and Grip, the resins had a suitable cementing consistency when a 30 mm. disk was produced. The consistencies of the four foregoing materials were too heavy for use as a cement at a 30 mm. disk. For these four materials, a disk diameter of 40 mm. was judged to coincide with a proper cementing consistency.

The slope of the lines in the graph (Fig. 2) indicates the degree of change in consistency with the powder-liquid ratio. As the slope of the lines approaches the horizontal, the more critical is the effect of slight changes in the powder-liquid proportions on consistency. In other words, the slope of the lines indicates the rate of polymerization which in turn is governed by a number of factors, the principal ones being the proportions of catalyst and promoter present and the solubility of the polymer (powder) in the monomer (liquid).

4. Paffenbarger, G. C.; Sweeney, W. T., and Isaacs, Aaron. Zinc phosphate cements: physical properties and a specification. J.A.D.A. 21:1907 Nov. 1934.

Table 3 • Some inorganic fillers from the resin powders

Type	Materials	Major elements determined by spectrographic analysis*	Compounds identified by petrographic analysis
	Acrynamel	Calcium Silicon Aluminum	Calcium carbonate Quartz Mica
	Dura	Calcium Barium Silicon	Calcium carbonate Barium carbonate
	Grip	Calcium Tungsten	† Calcium tungstate‡
Resin cements	Justi	Barium Silicon Titanium	Quartz §
	Smith's	Calcium Sodium	Calcium carbonate §
	Surgident	Sodium Zinc	†
	Tyton	Calcium Barium Silicon	Calcium carbonate Barium carbonate Quartz
	Vitacril	Titanium Silicon Zinc	†
Posterior-type direct filling resins	Dura Kore	Calcium Barium Silicon	Calcium carbonate Barium carbonate
	P. F.	Aluminum Sodium Silicon	Aluminum trioxide §

*More than 10 per cent.
†Particle size too small for petrographic identification.
‡Identified by roentgen ray diffraction.
§Two unidentified materials.

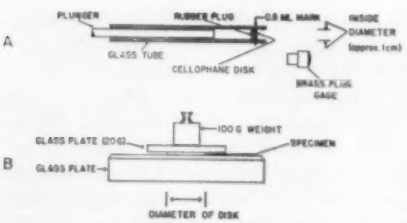


Fig. 1 • Apparatus used for measuring consistency of unset resin cements and direct filling resins for posterior teeth: A, glass tube used to measure volume of soft cement. B, weight and glass plates which flattened soft cement into a disk. Diameter of disk was used as a measure of consistency of mix

The data fell on a straight line when many of the resins were tested. Considerable scatter from a straight line occurred with some other resins. Repeated check tests confirmed this experience and indicated that the reproducibility of the data is connected with inherent characteristics of the individual products. The maximum standard deviation for a sample of any color (Table 1) was less than 1 mm., except Tyton and Surgident, in which cases the standard deviations were 2 and 1.5 mm., respectively.

Because the relative amount of monomer in a mix governs the shrinkage during polymerization, there should be some correlation between the powder-liquid ratios and the polymerization shrinkage. The resins in the upper portion of the graph (Fig. 2) should have less shrinkage than those in the lower part. As is shown in Figure 3, this relationship is generally present.

The test for consistency provides a simple and rapid method of detecting small differences among lots or batches and colors of the resin and could serve as a simple production control test.

TIME OF SETTING

In this report the time of setting is the elapsed period between the beginning of the mix and the time at which a standard 1 lb. Gillmore needle does not leave a perceptible circle on the surface of the cement specimen.

Apparatus and Method • The test was conducted as described in American Dental Association Specification No. 8 for Zinc Phosphate Cement[3] except that the specimen was transferred to an atmosphere of 100 per cent relative humidity at 37°C. (98.6°F.) in one minute instead of three minutes after starting the mix. This change was made because a proper mix of the resin may be made in 30 seconds while at least one and one-half minutes are required for making a proper mix of zinc phosphate cement. Also if the resin cement sets unprotected in the air, the monomer evaporates quickly causing the formation of a crust. This was especially true when thin, slow-setting mixes having a high monomer content were tested. In this case the crust became thick enough to support the weight of the needle even though the resin cement was not polymerized in the center of the specimen.

Test Results • The time of setting determined at three consistencies on all of the resins shows a much narrower spread (with the exception of Surgident) than either zinc phosphate or silicate cement (Table 4[5, 6]). In some instances (P.F., Tyton and Vitacril) there was as little as 30 seconds difference in the time of setting of very thin and very thick mixes. Therefore, the resin cements are far less critical than the zinc phosphate cements in variation of time of setting among different consistencies of mix.

As the Gillmore needle test for setting

5. Paffenbarger, G. C.; Sweeney, W. T., and Isaacs, Aaron. A preliminary report on the zinc phosphate cements. J.A.D.A. 20:1960 Nov. 1933.

6. Paffenbarger, G. C. Silicate cement: an investigation by a group of practicing dentists under the direction of the American Dental Association Research Fellowship at the National Bureau of Standards. J.A.D.A. 27:1611 Oct. 1940.

time uses a cylindrical specimen 6 mm. high and 10 mm. in diameter, it departs from clinical practice where a thin film of cement is used. Consequently data obtained by a rough test for setting time that employs thin films was compared with data obtained by the standard Gillmore needle test. The film setting-time test consisted of cementing two glass microscope slides together under a load of 100 Gm., with an overlap of approximately 25 sq. mm. on the ends and applying a 1 kg. load axially. This force would shear the unset, but not the set, film of cement. A new specimen was tested every 30 seconds until one was found that would sustain the load. Time of setting by this film test was approximately two minutes longer than the time of setting obtained by the Gillmore needle method.

Substances like eugenol interfere with or prevent the polymerization of the self-curing resins, hence prolong the time of setting indefinitely.

TEMPERATURE RISE DURING POLYMERIZATION

Some dentists may feel that sufficient heat is generated during the polymerization of these resins to be of consequence clinically. It was decided, therefore, to measure the temperature rise during hardening of the resins. The method employed was that used in other investiga-

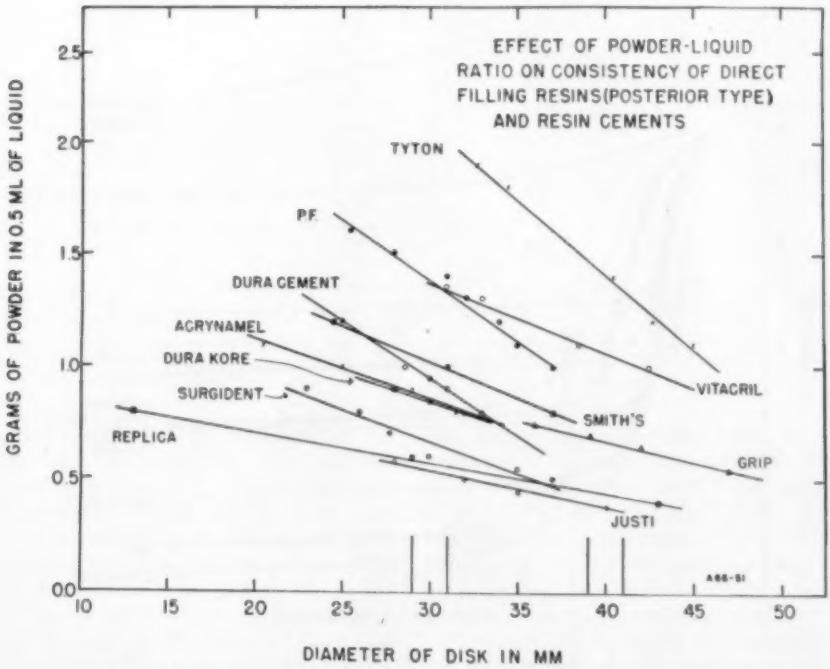


Fig. 2 • Effect of powder-liquid ratio on consistency of some mixed but unhardened dental resins. The 30± 1 mm. and the 40 ± 1 mm. areas as indicated by extended lines on bottom of diagram are the consistencies used in preparing specimens for the different tests

tions.[4, 7, 8] The data show that the temperature rise of resin cements on setting of a cylinder having a volume of 200 cu. mm. ranged from 10 to 41°C. above 37°C. which is comparable with the temperature rise of direct filling resins. As the cements are used in much smaller volumes than 200 cu. mm., no danger of overheating the pulp is anticipated.

SHRINKAGE ON POLYMERIZATION

The volume of shrinkage of the resins, of a zinc phosphate cement and of a silicate cement, as they pass from a fluid to a solid state, was measured by a displacement method previously described.[9] The data (Fig. 3) show that at the end of 30 minutes, the resins shrink from 3.4 to 8.3 per cent by volume; the silicate cement, 1.3 per cent; while the zinc phos-

7. Wolcott, R. B.; Paffenbarger, G. C., and Schoonover, I. C. Direct resinous filling materials: temperature rise during polymerization. J.A.D.A. 42:253 March 1951.

8. Paffenbarger, G. C.; Schoonover, I. C., and Souder, Wilmer. Dental silicate cements: physical and chemical properties and a specification. J.A.D.A. & D. Cosmos 25:32 Jan. 1938.

9. Smith, D. L., and Schoonover, I. C. Direct resin filling materials: dimensional changes resulting from polymerization shrinkage and water sorption. J.A.D.A. 46:540 May 1953.

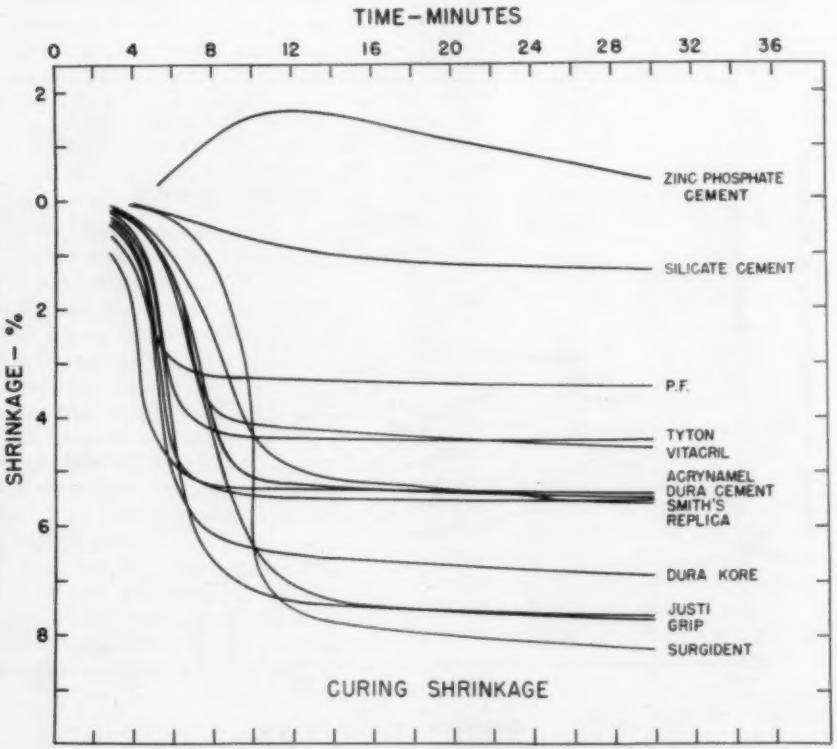


Fig. 3 • Volumetric shrinkage occurring as various dental resins and cements change from fluid to solid state

Table 4 • Time of setting of resins

Type	Material	Consistency	Gm. of powder in 0.5 ml. of liquid	Time of setting at 37°C. (98.6°F.)
Resin cements	Acrynamel	thin	0.65	7
		standard*	0.85	5
		thick	1.05	4
	Dura	thin	0.75	6
		standard*	0.95	5
		thick	1.15	4
	Grip	thin	0.45	9
		standard†	0.65	8
		thick	0.85	8
	Justi	thin	0.33	10
		standard†	0.38	7
		thick	0.48	5
	Replica	thin	0.35	11
		standard*	0.55	8
		thick	0.75	6
	Smith's	thin	0.85	6
		standard*	1.05	5
		thick	1.25	4
	Surgident	thin	0.45	—
		standard*	0.65	12
		thick	0.85	13
	Tyton	thin	1.20	4
		standard†	1.40	4
		thick	1.60	4
	Vitacril	thin	0.85	6
		standard†	1.05	6
		thick	1.25	6
Posterior-type direct filling resins	Dura Kore	thin	0.65	8
		standard*	0.85	6
		thick	1.05	5
	P. F.	thin	1.20	4
		standard*	1.40	4
		thick	1.60	4
Other dental materials	Zinc phosphate	Range at standard consistency		4 to 10[a]
		Thin to thick		over 120[b]
	Silicate cement	Range at standard consistency		4 to 10[a]
		Thin to thick		15 to 30[b]

*30 mm. disk (Fig. 2).
†40 mm. disk (Fig. 2).

phate cement had an expansion of 0.3 per cent. However, the slope of the terminal portion of the curves shows that the shrinkage of the resins is almost over at 30 minutes, but that the shrinkage of the zinc phosphate cement persists. The silicate cement continued to shrink for 24 hours, after which there was little change from the final value of 2 per cent by volume.[9] The zinc phosphate cement shrinkage was not followed beyond 30 minutes. A final volume shrinkage for a zinc phosphate cement in water was computed from data on the linear shrinkage in another report[5] as 0.15 per cent at the end of 30 days, after which no additional change was noted. Thus, the resins have considerably more shrinkage on hardening than do either the silicate or the zinc phosphate cements.

Shrinkage may not be as critical when the resin is used as a cement as when it is used as a filling. The film of cement pressed between two rough surfaces

Table 5 • Linear expansion on sorption of water by resin disks 0.5 mm. thick

Type	Material	1 day	3 months
		%	%
Resin cements	Acrynamel	0.2	0.1
	Dura	0.3	0.2
	Grip	0.3	0.5
	Justi	0.5	0.5
	Replica	0.6	0.7
	Smith's	0.3	0.3
	Surgident	0.3	0.2
	Tyton	0.6	0.5
	Vitacril	0.3	0.3
Posterior-type direct filling resins	Dura Kore	0.4	0.4
	P. F.	0.6	0.4

(those of an inlay and cavity) is restrained and stretched so that the shrinkage is localized. The amount of shrinkage of a thin cement film is of little practical significance. If a cement film 100 microns thick shrank 8 per cent by volume on hardening, the linear shrinkage would be 2.7 per cent. On a film 100 microns thick this would amount to about 3 microns.

EXPANSION ON SORPTION OF WATER

In common with denture base resins[10] and the direct filling resins,[9] the resin cements expand on sorption of water. The data in Table 5, obtained on single specimens by a previously described method,[9] show the expansion at one day and at three months. These data are of the same order as those obtained on direct filling resins.[9] The clinical significance of expansion caused by water sorption is not definitely known. It may be responsible for the resin cements not adhering to tooth structures under mouth conditions. As in the case of the shrinkage on polymerization, the actual dimensional change in the thickness of the film of a cement between an inlay and the tooth would be very small.

All of the resins and a zinc phosphate cement were placed in small cylindrical cavities prepared in stainless steel and in aluminum blocks, which were kept submerged in water at body temperatures for nine months. None of the materials expanded visibly above the surfaces of the blocks except Tyton. This behavior is not consistent with the data in Table 5.

SOLUBILITY AND DISINTEGRATION

Fully polymerized pure methyl methacrylate resin should be highly insoluble in water. However, the resin cements and filling materials contain catalysts, promoters, mineral fillers, and often considerable quantities of residual monomer. Therefore, it was decided to determine the solubilities by the method outlined in the American Dental Association Specification No. 8 for Zinc Phosphate Cement[3] with some modifications. These modifications were (1) the two flat plates were covered with 0.003 inch tin foil to facilitate removal of the specimens; (2) the plates and cement were placed in the 37°C. (98.6°F.) — 100 per cent relative humidity atmosphere at two instead of three minutes after start of mix; (3) after the water was evaporated, the weighing bottles were dried to constant weight at 120°C. (248°F.) instead of 149°C. (300°F.).

The residue obtained by this method is the amount of material dissolved and eroded by the distilled water from the specimens and is reported in Table 6 as the percentage of their original weight. The average solubility and disintegration of the resins is approximately the same as the maximum of 0.3 per cent permitted by the American Dental Association Specification for Zinc Phosphate Cement.[3] The zinc phosphate cements are attacked readily by sulfides, however, while the resins are not. Since sulfides

10. Sweeney, W. T. Denture base materials: acrylic resins. J.A.D.A. 26:1863 Nov. 1939.

are present in the mouth, they may be at least partially responsible for the failure of zinc phosphate cements in service. The silicate cements are not attacked by sulfides. This, too, may account for the fact that the silicate cements last longer in the mouth than zinc phosphate cements, even though the silicate cements are more soluble in water.[8] Thus this solubility test does not appear to represent some mouth conditions and should not be used to intercompare different types of dental materials. Experience, however, has shown that the test is useful when cements of the same type are being compared.

A 1 per cent solution of glucose was mixed with saliva in a ratio of 3 to 1 and allowed to ferment until it reached a pH of 3.4. When films of resins, 0.5 mm. thick, were immersed in this glucose-saliva mixture, bubbles developed on the surfaces of Acrynamel and Dura Cement in 24 hours. The color of the surfaces of Acrynamel, Dura Cement, Dura Kore, and Smith's Resin Cement in contact with the mixture was bleached. The surface of the zinc phosphate cement darkened. The gloss was not removed from the surface of the resins after a week's immersion. The surface of the zinc phosphate cement was so severely attacked that it could be rubbed off easily.

When the resin films were immersed in 5 per cent solutions of acetic acid (pH 2.4), citric acid (pH 1.9), and lactic acid (pH 1.8), all of the cements which contained carbonate fillers—namely, Acrynamel, Dura Cement, Dura Kore, Smith's and Tyton—had gas bubbles form on the surface and were bleached severely. The other resins were not visibly affected. A 5 per cent solution of ammonium hydroxide had little or no visible effect on any of the resins.

OPACITY

The dentist is interested in the opacity of cement to both visible light and roentgen rays, the former for esthetic purposes and the latter for oral diagnosis.

Optical Opacity • The optical opacities of enamel, dentin and silicate cements were given in a previous report[8] wherein the limits of opacity for silicate cements were set at a range of 35 to 55 per cent on specimens 1 mm. thick. This range was based largely on the average opacity of enamel—39 per cent, and of dentin—70 per cent. It would therefore be desirable for any filling material to have an opacity in the range of 35 to 55 per cent. This opacity range would also be desirable in a cement used with translucent materials such as fused porcelain and synthetic resins.

The optical opacity of the resins was determined by the method outlined in American Dental Association Specification No. 9 for Dental Silicate Cement,[2] except that the glass plates, between which the 1 mm. thick specimen was molded, were covered with tin foil (0.003 in. thick) to facilitate removal of the specimen. Also the time of placing the mix between the plates was one minute

Table 6 • Solubility and disintegration of resin cements in distilled water

Type	Material	Weight loss
		%
Resin cements	Acrynamel	0.4
	Dura	0.3
	Grip	0.1
	Justi	0.0
	Replica	0.1
	Smith's	0.4
	Surgident	0.1
	Tyton	0.4
	Vitacril	0.2
Posterior-type direct filling resins	Dura Kore	0.4
	P. F.	0.3
Other dental materials	Zinc phosphate cement	0.3*
	Silicate cement	1.4†

*Maximum permitted by American Dental Association Specification No. 8.[8]

†Maximum permitted by American Dental Association Specification No. 9.[2]

Table 7 • Optical opacity of resin cements and posterior-type direct filling resins

Type	Material	Variations with color
		$C_{0.70}$*
Resin cements	Acrynamel	0.45 – 1.00
	Dura	0.55 – 0.70
	Grip	1.00
	Justi	0.60 – 1.00
	Replica	0.40 – 0.45
	Smith's	0.50 – 0.60
	Surgident	0.70> – 1.00
	Tyton	0.70> – 1.00
	Vitacril	0.70 – 0.70>
Posterior-type direct filling resins	Dura Kore	0.60 – 1.00
	P. F.	0.45 – 0.60
Zinc phosphate cements[11]		1.00
Silicate cements[3]		0.35 – 0.55

*The $C_{0.70}$ value represents the daylight apparent reflectance (R_0) of the cement specimen (1 mm. thick) when placed over a black glass backing divided by the daylight apparent reflectance ($R_{0.70}$) of the cement specimen when placed against a white backing with an apparent daylight reflectance relative to MgO of 70 per cent. When the reflectances are the same, the $C_{0.70}$ value is 1.00 and the cement is 100 per cent opaque. If $C_{0.70}$ is equal to 0.50, the cement is said to be 50 per cent opaque, and so on.

instead of three minutes after beginning the mix.

The opacities for the various resins are given in Table 7. The color of some of the resin cements has a pronounced effect on the opacity, the lighter colors being less opaque. It is possible, however, as the data in Table 7 show, to produce a resin cement with the proper optical opacity for cementing translucent filling materials. The red and black copper phosphate cements, the zinc phosphate cements and the zinc oxide-eugenol cements are all 100 per cent optically opaque on specimens 1 mm. thick.[11]

Radiopacity • When using cements as a base under other restorations or for cementing opaque materials, the cements should be as radiopaque as possible in thin sections so that there will be no confusion on the roentgen ray picture between the cement and decayed areas.

The radiopacity was determined by taking a roentgenogram of a six-step wedge of cement (Fig. 4) under a set of standard conditions. As each step was approximately 0.5 mm. thick, the six-step wedge ranged in thickness from 0.5 to 3.0 mm. The exposures were made at normal incidence with a film-target distance of 16 inches at 10 milliamperes and 65 kilovolt peak. Kodak Radiatized film was exposed for one second. The solutions were Eastman Kodak liquid developer and fixer made up according to the manufacturer's directions. The film was agitated constantly during processing, developed 4½ minutes at 20°C., rinsed for two minutes in running water, shaken as dry as possible, fixed for 10 minutes and washed for 20 minutes in running water.

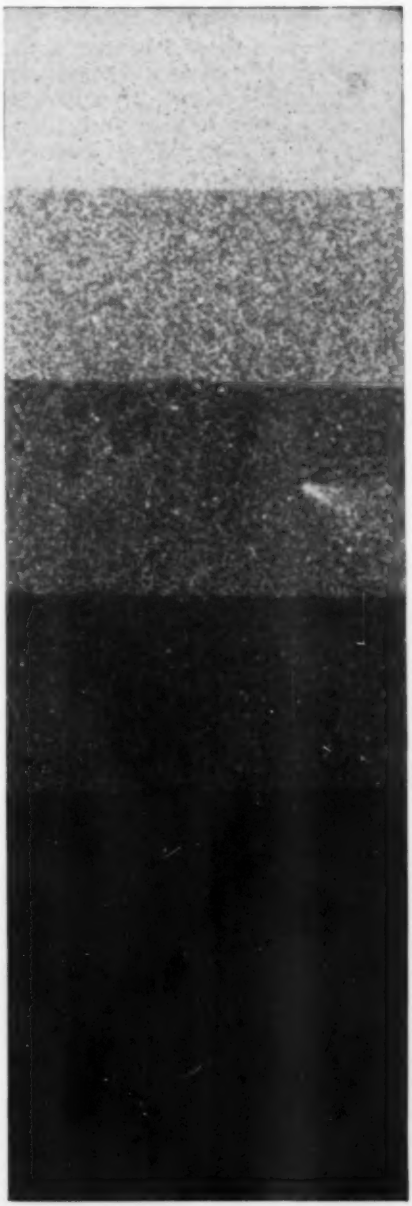
Film densities for various thickness of the cement wedges were read on the zero to three scale of an Ansco densitometer. The data on the 2 mm. thick step in the wedge are presented in Table 8. The lower readings indicate the greater radiopacity. The resin cements should be as radiopaque as zinc phosphate cements, if used as a base or as a cement for opaque filling materials. Only Grip had such a radiopacity. Most of the resins were less radiopaque than silicate cements.

FILM THICKNESS

If a cast restoration of lost tooth structure is to be seated accurately, the cement film between the casting and the tooth should be as thin as possible. Thus, the cementing medium should have only small particles in it. One method for determining the effect of particle size of the cement powder on the cement film is to measure the thickness of a film between optically flat plates. Such a test, which is a part of American Dental Association Specification No. 8 for Zinc Phosphate Cement,[3] was employed, except that the

11. Paffenbarger, G. C., and Caul, H. J. Dental cements. Proceedings of the Dental Centenary Celebration. Baltimore, The Waverly Press, 1940, p. 232-238.

Fig. 4 • Positive of a roentgen ray negative of a step-wedge of a dental resin cement. Increasing density of each step is caused by increasing the thickness 0.5 mm. The darkest step was 3.0 mm. thick, the lightest 0.5 mm. thick



load was applied to the plates one minute instead of three minutes after mixing was started. The data (Table 9[12]) show that a film thickness as low as 10 microns may be obtained with one resin cement (Grip). Six of the cements would comply with the film thickness requirement of the American Dental Association Specification for Zinc Phosphate Cement[3] as they had a film thickness of 40 microns (0.0016 in.) or less at the standard consistencies (Fig. 2). Thinner than standard consistencies produced films less thick, and thicker than standard consistencies produced films of greater thickness. This is probably because monomer in excess softens the polymer grains in the powder which permits them to be flattened before the cements harden. Evidently the particle size of the inorganic fillers was less than that of the polymer particles in the cement.

The data on film thickness in Table 9 show that resin cements can be formulated that have thinner films than any of the currently certified zinc phosphate cements.

COMPRESSIVE STRENGTH

The compressive strength of a dental filling material should give some indication of its resistance to masticatory forces. The compressive strength of a cement should be useful in evaluating the ability of a cement to hold restorations in place. As will be shown subsequently, the retention is not due to the true adhesion of the cements to tooth structure or to the restoration being cemented, but to a mechanical interlocking when the cement flows into the irregularities of the surfaces

Table 8 • Radiopacity of some resins, enamel and dentin

Type	Material	Film density*
Resin cements	Acrynamel	2.7
	Dura	1.9
	Grip	0.8
	Justi	2.7
	Replica	2.9
	Smith's	2.4
	Surgident	2.2
	Tyton	1.8
	Vitacril	2.9
Posterior-type direct filling resins	Dura Kore	1.9
	P. F.	2.7
Other dental cements	Silicate	1.9
	Zinc oxide-eugenol	0.6
	Zinc phosphate	0.8
Hard tooth tissues	Dentin†	1.3
	Enamel†	1.1

*Average readings on the 2 mm. thick specimens recorded as observed on the zero to three scale. The lower the film density readings the greater the radiopacity.

†Data from curve drawn from readings of five molars.

of the cavity and the restoration. To displace the restoration it is necessary to shear off these minute projections; the higher the compressive strength, the higher the force required to shear them. The strength of the individual particles of powder in the set cement would influence the amount of shear required to dislodge a cemented restoration if the particle was large enough to wedge between the surfaces of the cavity and the restoration.

Table 9 • Film thickness of resin cements

Material	Film thickness
	microns
Acrynamel	60
Dura	40
Grip	10
Justi	25
Replica	120
Smith's	25
Surgident	30
Tyton	25
Vitacril	85
Zinc phosphate cements on List of Certified Dental Materials[12]	30 to 40

The compressive strength of the resins was determined on specimens one hour and one week old by the procedure used in determining the compressive strength of silicate cement[2] except as follows: (1) the test cylinders were 6 mm. (0.236 in.) in diameter and 10 mm. (0.394 in.) high; (2) tin foil [0.076 mm. (0.003 in.) thick] covered the glass plates used in forming the ends of the molds in which the test cylinders were prepared; (3) these plates and the stainless steel molds were lubricated sparingly with a silicone (Dow-Corning high vacuum grease); (4) the ends of the test cylinders were made plane and parallel by facing the specimens on a lathe. The aluminum oxide filler present in P.F. dulled the cutting tool so badly that it had to be resharpened after cutting each specimen. (This dulling of instruments by the aluminum oxide abrasive has been observed by dentists in cutting P.F. with a dental bur and should not be interpreted as indicating that this resin is extremely hard.)

It was difficult to obtain smooth-sided cylinders with some of the cements having high shrinkage values (Fig. 3). Better specimens of these cements were obtained by filling a retaining ring approximately half full of the resin and by inserting the mold inside this ring thus causing the powder-liquid mixture to rise from the bottom to the top surface of the mold, in much the same manner as specimens used in the test for compression of the hydrocolloidal impression materials are formed.[13]

The resins did not fracture on failure in compression in the same manner as the various dental cements and amalgam which, being brittle, suddenly go to pieces at the ultimate load. Instead it was

12. American Dental Association, Council on Dental Research. List of certified dental materials revised to December 15, 1954. J.A.D.A. 50:199 Feb. 1955.

13. Paffenbarger, G. C. Hydrocolloidal impression materials: physical properties and a specification. J.A.D.A. 27:373 March 1940.

found that the test cylinders of the resin barrel-out and sometimes shear diagonally.

The compressive strengths of the resins and various other dental restorative materials are given in Table 10.[14,15] As is common with most restorative materials formed by a chemical reaction between a powder and a liquid, the resin cements generally increase in strength with time. The strength at one week is usually more than that at one hour. These data also show that the compressive strength of the resin cements at one week is on the average roughly two to five times that of zinc oxide-eugenol cement; seven eighths of the minimum value (12,000 lb. per square inch) for zinc phosphate cement in American Dental Association Specification No. 8[3]; less than one half the 24 hour minimum value (23,000 lb. per square inch) for silicate cements in American Dental Association Specification No. 9[2]; and

14. Worner, Howard K. The physical and mechanical properties of "copper" cements, Austral. J. Den. 44:411 Dec. 1940; 45:1 Jan. 1941.

15. Souder, Wilmer, and Peters, Chauncey, G. An investigation of the physical properties of dental materials. D. Cosmos 62:305 March 1920.

Table 10 • Compressive strength of some dental restorative materials

Type	Material	Age of specimens: 1 hr.	Age of specimens: 1 wk.	Consistency
		lb. sq. in.	lb. sq. in.	
Resin cements	Acrynamel	9,500 ± 500	10,000 ± 700	Cementing
	Dura	9,000 ± 300	11,500 ± 200	Cementing
	Grip	10,000 ± 800	12,000 ± 500	Cementing
	Justi	8,000 ± 400	10,500 ± 300	Cementing
	Replica	8,500 ± 200	10,000 ± 200	Cementing
	Smith's	11,000 ± 200	12,500 ± 300	Cementing
	Surgident	6,000 ± 200	7,500 ± 100	Cementing
	Tyton	10,500 ± 100	10,500 ± 300	Cementing
	Vitacril	9,000 ± 300	10,500 ± 200	Cementing
Posterior-type direct filling resins	Dura Kore	8,500 ± 200	11,000 ± 600	Filling or cementing
	P. F.	10,500 ± 100	11,000 ± 100	Filling or cementing
Other dental cements and filling materials	Zinc oxide-eugenol cement		2,000 to 5,000[11]	Filling
	Red copper phosphate cement		14,000[14]	Cementing
			21,000[11]	Filling
	Black copper phosphate cement		6,000 to 22,000[14]	Filling
			9,000[11]	Filling
	Zinc phosphate cement	2,300 to 9,200[4]	2,000 to 13,800[4]	Cementing
			19,000[11]	Filling
	Zinc silicate cement		22,000 to 25,000[11]	Filling
	Silicate cement	12,000*	10,500 to 21,500[8]	Filling
	Amalgam		30,000 to 51,550[13]	Filling

*Unpublished data collected in a former investigation.[8]

from one third to one fifth that of amalgam.

The clinical use of zinc oxide-eugenol cements, zinc phosphate cements, silicate cements and dental amalgam has placed their lasting qualities against masticatory stresses in the mouth in the same order as their compressive strength (Table 10). Since the resins have about the same compressive strength as the zinc phosphate cements which do not hold up well in the mouth, it is not unreasonable to assume that the direct filling resins cannot be used successfully for restorations subject to masticatory forces. Experience with indirect filling resins proved this.

It is believed that the resin cements should retain an inlay or other appliance in place to about the same degree as zinc phosphate cements on the basis of their comparative compressive strengths.

INDENTATION HARDNESS

The hardness of the resins, as determined by the Knoop indenter, fell within a range of 9 to 16 kg. per square millimeter, indicating that these resins are no more resistant to indentation than polymethyl methacrylate denture base resin. The incorporation of an abrasive such as alumina in P.F. does not make the resin significantly harder, but the alumina does make the compound abrasive.

ADHESION

A rough screening test for adhesion was employed to find out if any of the resin cements or the direct filling resins (posterior type) were actually adhesive to enamel and dentin under conditions of use. A flat surface was ground on one side of the crowns of freshly extracted teeth which were not allowed to dry out. The flat surface of enamel and dentin was swabbed with cotton pellets and dried with warm air as is done in practice. The various resins were then applied to the clean, dried surface.

All of the resins showed an initial adhesion to the tooth tissues, and if the tooth and resin were kept dry the adhesion was so strong that usually the tooth would be broken if an attempt was made to remove the resin. After soaking the tooth with the resin on it in water, however, this adhesion was lost. There were no exceptions, and zinc phosphate cement adhered as long as the resin cements. After 24 hours soaking in water most of the cements could be dislodged easily; after one week soaking, all of them could.

Similar tests were performed in the mouth using the buccal surfaces of the lower posterior teeth except, of course, that the surfaces of the teeth were not ground. The teeth were isolated under a rubber dam, and the buccal surfaces were cleaned and dried with cotton and warm air blasts and a small amount of resin was applied to every other tooth; zinc phosphate cement was used on the alternate teeth. At the end of one week, all were off. The zinc phosphate cement persisted as long as the resin cements.

COLOR STABILITY

Experience over a number of years has shown that the results of laboratory tests in which the color stability procedure outlined in American Dental Association Specification No. 12 for Denture Base Resin was used correlate with service conditions. The denture base resins that discolored under this test discolored in use. The same held for the denture repair resins and the direct filling resins. The procedure was employed, therefore, to test the color stability of the resin cements. None of the materials (Table 1) complied with the requirements. Some discolored more than others. Methods for making the self-curing resins color stable to ultraviolet light are now available; hence these resin cements will probably be made color stable soon.

As pointed out previously in the dis-

cussion of the solubility of the resin cements, those containing carbonate fillers bleach in the presence of acids such as those present in an incubated glucose-saliva mixture.

BIOLOGICAL EFFECTS

The authors have not discovered any literature on the effect of the resin cements on the tooth pulp. Nor were reports found of gross pulp damage after clinical use. The similarity of the resin cements to the direct filling resins (anterior type) would suggest about the same degree of pulp irritation with resin cements as occurs with the direct filling resins. As is well known, there is considerable controversy in the literature dealing with laboratory and clinical experience on the degree of irritation caused by the self-curing resins. An extensive study by Johnston[16] with one resin cement on the whole seemed to be favorable.

SUMMARY AND CONCLUSIONS

Data presented deal with the physical and chemical evaluation of nine resin cements and two posterior-type direct-filling resins. All of these resins are somewhat similar to the anterior-type direct-filling resins. None of the resins contained significant amounts of arsenic. The major difference between these resins and the anterior-type direct-filling resins appears to be the use of mineral fillers in the cements which run from 5 to 67 per cent by weight of the powders.

All tests on physical properties were conducted on specimens made from standard consistencies using modifications of tests outlined in American Dental Association Specifications for Zinc Phosphate Cement,[8] Silicate Cement,[2] and Denture Base Resin.[17]

The time of setting ranged from 4 to 12 minutes at the standard consistencies. Large deviations from the standard consistencies usually had a surprisingly small effect on the time of setting. The resins were much less sensitive than the zinc phosphate or silicate cements to consistency variations.

The temperature rise on setting of a cylinder having a volume of 200 cu. mm. ranged from 10 to 41°C. above 37°C. which is comparable to that of the direct filling resins. As the cements are used in much smaller volumes than 200 cu. mm., no danger of overheating the pulp is anticipated.

The shrinkage on polymerization ranged from roughly 3 to 8 per cent by volume which is far more than reported shrinkages for zinc phosphate cement (0.15 per cent) and silicate cement (2 per cent). The shrinkage, while being a very objectionable property, is less critical in a cement than in a filling material because the cement generally is used as a thin film in which the shrinkage in its length is localized by the restraint of the surfaces being cemented. The shrinkage of the cement over even a comparatively wide cement margin is not large. Even with a cement having a shrinkage of 8 per cent by volume, the linear shrinkage of a film 100 microns thick would be only about 3 microns.

The resins expanded linearly on sorption of water from 0.2 to 0.6 per cent on disks 0.5 mm. thick in one day. In five resins the expansion decreased with time up to three months' immersion. In two there was a slight increase, while in four there was no significant change in the one day and three month values. The expansion caused by water sorption may be responsible for failure of the initial adhesion of the cement to hard tooth tissues.

The resin materials were slightly soluble in distilled water. When subjected to

16. Johnston, J. F. A one-year evaluation of an acrylic cement. J. Pros. Den. 4:689 Sept. 1954.

17. Swaney, Aubrey C., and others. American Dental Association specification no. 12 for denture base resin, second revision. J.A.D.A. 46:54 Jan. 1953.

the solubility test used in the American Dental Association Specification for Zinc Phosphate Cements,[3] the cements and direct filling resins ranged in solubility from almost zero to 0.4 per cent by weight. The resin cements having carbonate fillers were attacked by a glucose-saliva mixture.

Resin cements may be made with optical opacities in the range of human enamel or dentin. These cements would be useful in cementing translucent filling materials such as fused porcelain. The resin cements can be made as radiopaque as zinc phosphate cement. Such opacities are needed when cementing opaque materials like the gold alloys, or when using the cement as a base for other filling materials. The high radiopacity is needed to distinguish the cement from recurrent or unexcavated decay in interpreting roentgenograms.

The film thickness of one of the resin cements was as low as 10 microns; this is considerably thinner than the minimum thicknesses obtained with current zinc phosphate cements, which range from 30 to 40 microns. Therefore, resin cements can be formulated that should permit very close seating of inlays and other dental appliances.

The compressive strength of the resins was from two to five times that of zinc oxide-eugenol cement, near that of the zinc phosphate cement, less than half that of silicate cement and from one third to one fifth that of amalgam. Clinical experiences based on the resistance to mastication arrange the foregoing materials in the same order as the compressive strength values.

The indentation hardness (Knoop) number was of the same order as that of other dental resins.

All of the cements and posterior-type direct filling resins adhered to the tooth tissues if kept dry. No adhesion was retained under oral conditions.

None of the materials was color stable to ultraviolet light as determined by the color stability test employed in the American Dental Association Specification No. 12 for Denture Base Resin.[17] Since self-curing acrylic resins can now be made color stable, undoubtedly the resin cements and direct filling resins presently available will all be made color stable or relatively so to ultraviolet light.

No bioassay of the resin cements has been found in the literature nor are the authors acquainted with reports of gross pulp damage after clinical use. The similarity of the resin cements to the anterior-type direct filling resins would suggest about the same degree of pulp reaction with the resin cements as occurs with the direct filling resins.

At the present stage of development it might be well to consider the resin cements as experimental materials and not as outright unlimited substitutes for zinc phosphate cement.

Knowledge Depends on a Number of Things • What we know about the world depends on what we can do, and this depends on the instruments at our disposal, the material we have available to make the instruments, and the skill of our hands with which we use these instruments. *Justus von Liebig.*

CYST OF THE MANDIBLE

By Donald R. Mackay, D.D.S., St. Paul.

The patient, a 45 year old woman, complained of a bad taste and drainage in the back of the mouth on the left side of the lower jaw. The condition had been noticeable for three months. The lower left third molar had been extracted with no complications about 10 years previously. Her physical history was essentially negative.

The patient was normally developed and in good physical condition. All her lower teeth had been extracted except for the six anterior teeth, the first bicuspid and the second molar on the left side. In the upper arch the second molar, second bicuspid, cuspid and central incisor on the left side, the central and lateral incisors, cuspid, first and second bicuspid and first molar on the right side were present.

The general condition of the gingiva and supporting tissues was within normal limits. There was a fistula in the lower left retromolar triangle distal to the second molar. The second molar was firm in the alveolus but was negative to a vitality test. There was no demonstrable expansion of the ramus or body of the mandible. There was no evidence of adenitis of the submaxillary glands. There was no anesthesia or paresthesia. Intraoral periapical and lateral head roentgenograms indicated a radiolucent area resembling a single cyst extending from the region of the third molar posteriorly to the apex of the second molar and filling the entire left ramus of the mandible. Extraoral roentgenograms showed extensive destruction of tissue in the mandible (Fig. 1).

Because the lower left second molar was nonvital, it was extracted, and access to the cystic region was obtained from a superior and anterior approach. Tissue was removed for biopsy, and an exploratory examination was made. The cavity was filled with a purulent fluid. The lining of the cavity was a well-defined membrane approximately 3 mm. in thickness. A small catheter was introduced without difficulty and inserted into the anterior border of the ramus well up into the posterior condylar region (Fig. 2, left). The extracted molar was sectioned, and found to have a dry "withered" pulp.

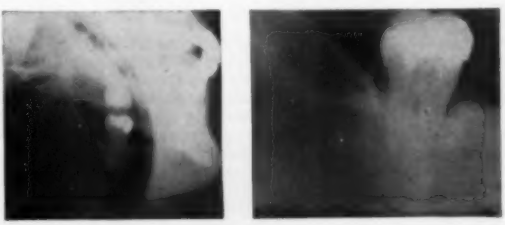
The pathologist reported a squamous cell mucous membrane with a chronic granulomatous inflammatory process. The diagnosis was pyogenic granuloma or cyst.

In view of the extensive involvement of the mandible and the nerve and vascular tissues involved, a large window (Partsch type operation) was made in the retromolar region, and an acrylic obturator was fitted into and over the opening. A small catheter was inserted as far inferiorly and superiorly into the ramus as possible and made in-dwelling (Fig. 2, right). The catheter was used for about three weeks to aid in irrigation of the cyst. The catheter was then removed by stages, approximately one inch at a time, to insure adequate irrigating of the space. The healing process and treatment extended over approximately four and a half months and was found to be uneventful.

Lateral roentgenograms of the mandible five months postoperatively (Fig. 3, left) disclosed good regeneration of the ramus with the exception of a small section in the region of the mandibular foramen. Intraoral roentgenograms of the retromolar region taken 11 months postoperatively indicated a well-regenerated mandible (Fig. 3, right).

The extensive involvement of the ramus of the mandible and its nerve and blood supply makes the treatment of this lesion by any means other than the open (Partsch) method

Fig. 1 • Extensive destruction of tissue by cyst filling left ramus of mandible from region of third molar to apex of second molar



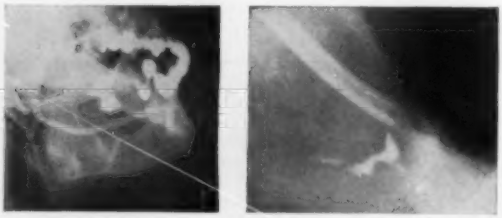
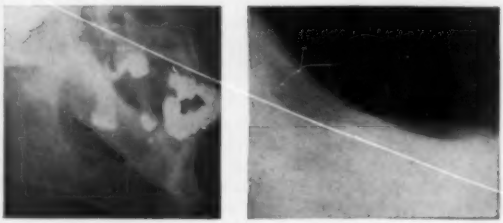


Fig. 2 • Left: Catheter inserted into cyst extends in posterior condylar region. Right: In-dwelling catheter in position aids irrigation of cyst

Fig. 3 • Left: Five months postoperatively regeneration of ramus is good except for small radiolucent area in region of mandibular foramen. Right: Roentgenogram taken 11 months postoperatively indicates good regeneration of mandible



difficult. The task of reaching all regions of the cavity was accomplished by maintaining the in-dwelling catheter until regeneration in the extreme limits was demonstrable. The classification of the lesion is not definite because of the lack of a more complete history and other additional information.

The presence of a dry degenerated pulp in the extracted second molar indicates that the lesion may have caused the death of the pulp. Differentiation between a follicular cyst or a residual cyst resulting from the previously extracted third molar would be difficult; the theory of expansion in the line of least resistance might lead to speculation on the presence of an undisclosed aborted tooth follicle within the substance of the ramus. The treatment, however, must have as its basis a representative biopsy section and diagnosis.

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Reformation of Science • The fact cannot be disputed that great discoveries regarding the behavior of the external world have been made by workers whose investigations in their field of research were not related in their own minds to any interest or belief outside it. But the effect of such segregated thinking has been to make science a departmental affair, having no influence on life and thought except indirectly through its applications. At the present time there is a movement in scientific circles aiming at securing for science a greater influence on human affairs, and even calling for a refounding of civilization on a scientific basis; but its advocates do not always understand that, as a necessary condition for the possibility of such a reform, science must be reintegrated into a unity with philosophy and religion. *E. T. Whittaker, presidential address, Royal Society of Edinburgh, 1942; Science 98, 270, 1943.*

TWIN IMPACTION OF MANDIBULAR SECOND AND THIRD MOLARS

By Jack E. Arch, D.D.S., Pittsburgh.

Bitewing roentgenograms of a 19 year old boy revealed impacted second and third mandibular molars on both sides. The patient complained of intermittent pain and of a ringing in the left ear, a sensation particularly noticeable when he lay down. Oral examination revealed an enlarged area in the left retromolar region. The overlying tissue was slightly inflamed from irritation caused by the maxillary molars.

Periapical and occlusal roentgenograms were taken to aid in the localization of the impacted teeth. A follicular cyst circumscribed the crowns of the left mandibular impacted teeth. The second molar was in a distoangular position immediately posterior to the first molar. The third molar lay in an inverted mesioangular position, its crown resting on the crown of the second molar (illustration).

The impacted teeth on the left side were removed first. The anesthetic agent used was lidocaine hydrochloride, 1:50,000 epinephrine. Mandibular block and infiltration around the immediate region to reduce hemorrhage was given.

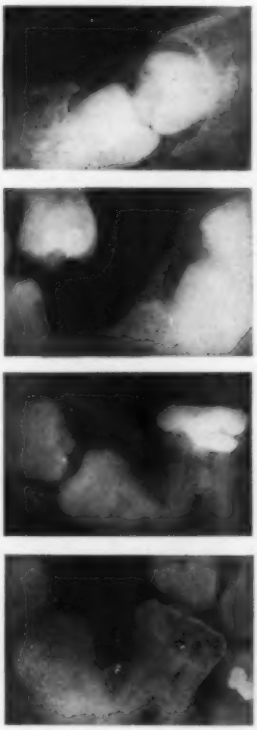
An incision was made along the anterior border of the ramus to the distal border of the first molar and then at a 45 degree angle to the mucobuccal fold. The mucoperiosteum was reflected, exposing the overlying bone. The overlying bone was excised by use of osteotomes, revealing the membrane of the cyst.

After excising and reflecting the cystic membrane, the crown of the third molar and the tips of the cusps of the second molar were exposed. By alternate use of the surgical bur and the osteotome, the buccal plate was removed to the distal aspect of the crown of the third molar. The third molar was then elevated out of its socket.

The roots of the second molar were hooked lingually. It was necessary to remove the buccal plate over this tooth until it could be rotated out buccodistally with an elevator.

A rongeur forceps was used to remove the bony projections. A bone file was then applied to smooth the bone. The sockets were curetted and cleaned of all particles and remaining follicle membrane. The incision was closed with no. 00 silk sutures.

Postoperatively, the patient was instructed to keep a gauze pack in place for a half hour and to change it if bleeding persisted. After hemorrhage stopped, ice packs were to be applied to the side of the face for a half hour, every hour, for the next three hours. A preparation of acetylsalicylic acid, phenacetin and caffeine citrate (APC) and codeine sulfate, 0.5 grains, were prescribed for pain. Aureomycin, 250 mg., capsules were prescribed also: four capsules each day for three days.



Left and right mandibular periapical roentgenograms and bitewing roentgenograms reveal presence of impacted second and third molars and cystic structure circumscribing crowns

The patient returned the next day for postoperative examination. There had been little pain and only moderate edema. The hemorrhage had stopped shortly after the patient had left the clinic. Heat was prescribed along with hot saline mouthwash.

Four days after the operation, the patient returned for removal of the sutures. Edema was slight; a small amount of trismus was experienced. The ringing in the ears was gone. An appointment was made for removal of the impacted teeth on the right side.

The pathologic diagnosis was cystic membrane of fibrous tissue. The microscopic picture revealed "a rather dense fibrous tissue that appears to be the wall of a cystic structure.

However, no epithelial lining can be identified . . . and the exact nature of the cystic structure cannot be ascertained."

Thoma[1] states, "Eruption cysts forming over the crown of the tooth present an early development of dentigerous cysts and tend to cause back pressure on the crown of the tooth." This process could explain the etiology of the cyst in the described case, but the reason for the two teeth found in a single sac remains unknown. It is possible that when the epithelium proliferated forming the dental lamina during the development of the tooth organ these two teeth geminated with a single epithelial follicle.

3141 Beechwood Boulevard

Formerly first lieutenant, U. S. Army, Funston Dental Clinic.

1. Thoma, K. H. Oral pathology. London, Henry Kimpton, 1946, page 174.

TREATMENT OF PARTIAL CLEFT LIP

By Omur Kustaloglu, D.D.S., Karsiyaka, Izmir, Turkey.

A 24 year old man was treated for a partial cleft lip. His history showed he had had no serious illness, nor was there any record of cleft lip in his family. A general physical examination showed him to be in good health. There was no evidence of diabetic disturbance.

Roentgenographic and clinical examinations showed that both maxillary and mandibular first bicuspids had been extracted. The second maxillary bicuspids on the left side also had been extracted. The roots of the maxillary right first molar were infected. All other teeth were normal. The gingiva and mucous membranes of the mouth were normal as well. Several labial frenums were present at the junction of the cleft lip and the vestibule of the mouth.

The left nostril was flattened and the tip of the nose deviated slightly to the right. A scar led from the cleft to the base of the nose. The left side of the lip was a little more inflated than the right (illustration, above and center).

Penicillin, 400,000 units, was injected preoperatively. Under local anesthesia the sides of the cleft were freshened, pulled together and sutured deep in the mucous membrane. The right section was shortened; the left side was lapped over the right and sutured.

To prevent inflammation after the operation, penicillin was given postoperatively for two days. Recovery was uneventful. The lip is normal; the nostrils have been corrected. Correction of the nostrils helps to hide the rightward deviation of the nose (illustration, below). One week after the operation, the patient was discharged.

1700 Cd. Number 146

Partial cleft lip before and six days after treatment

BUREAU OF LIBRARY AND INDEXING SERVICE

Additions to the Library

The books listed here have been added recently to the Library collection. Requests for this material, available on loan to all members of the Association, should be addressed to the Bureau of Library and Indexing Service. There is no charge for borrowing these books. Most of the books may be purchased also through the Library.

BOOKS

ABEL-SMITH, BRIAN & TITMUS, R. M. The cost of national health service in England and Wales. Cambridge, Cambridge Univ., 1956. 176 p. $5.50.

ADAMS, C. P. The design and construction of removable orthodontic appliances. Bristol, Wright, 1955. 96 p. $3.60.

AMERICAN DENTAL ASSOCIATION. American dental directory, 1956. Chicago, The Association, 1956. 1,110 p. $7.50.

AMERICAN DENTAL ASSOCIATION. BUREAU OF DENTAL HEALTH EDUCATION. Suggestions and guides for dental societies planning dental health education programs. Chicago, The Association, 1955. 18 p.

AMERICAN DENTAL ASSOCIATION. BUREAU OF LIBRARY AND INDEXING SERVICE. Index to dental literature in the English language, 1955. Chicago, The Association, 1956. 235 p.

AMERICAN DENTAL ASSOCIATION. COUNCIL ON DENTAL THERAPEUTICS. Accepted dental remedies. 21st ed. Chicago, The Association, 1956. 206 p. $2.

AMERICAN MEDICAL ASSOCIATION. COUNCIL ON SCIENTIFIC ASSEMBLY. A. M. A. scientific exhibits 1955. New York, Grune & Stratton, 1955. 784 p. $20.

BRITISH SOCIETY FOR THE STUDY OF ORTHODONTICS. Transactions, 1954. London, Wright, 1955. 151 p.

BRÜCK, DIETRICH. Die Fokallehre. Heidelberg, Dr. Alfred Hüthig, 1951. 191 p.

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FOURNET, S. C. Fournet impression technique and other full denture procedures with 120 visual illustrations of the anatomy and each step of the technique. n.p., Author, n.d. 56 p.

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IOWA STATE DEPT. OF HEALTH. BUREAU OF DENTAL HYGIENE. The handbook of dental health education for the elementary school teacher. Iowa City, State Univ. of Iowa, 1955. 48 p.

KELSTEN, L. B. Pedodontics for the general practitioner; a textbook of oral pediatrics. Brooklyn, Dental Items of Interest, 1956. 396 p. $9.75.

KEMÉNY, IMRE. Die klinischen Grundlagen der totalen Prothese. Leipzig, Barth, 1955. 167 p.

MACINTOSH, R. R. & OSTLERE, MARY. Local analgesia head and neck. Edinburgh, Livingstone, 1955. 138 p. $6.50.

MCCOY, J. D. & SHEPARD, E. E. Applied orthodontics. 7th ed. Philadelphia, Lea & Febiger, 1956. 336 p. $7.50.

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MICHAELIS, A. R. Research films in biology, anthropology, psychology and medicine. New York, Academic, 1955. 490 p. $10.

MORRISON, A. H. & BERMAN, LEONARD. Restorative technics with the ultrasonic dental unit. New York, The Authors, 1955. 48 p.

NATIONAL EDUCATION ASSOCIATION. Opinions of the Committee on Professional Ethics. Washington, The Association, 1955. 72 p. $0.25.

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ROWE, N. L. & KILLEY, H. C. Fractures of the facial skeleton. Baltimore, Williams & Wilkins, 1955. 923 p. $22.

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STRÖMGREN, H. V. Index of dental and adjacent topics in medical and surgical works before 1800. (Library Research Monographs Vol. 4). Copenhagen, Munksgaard, 1955. 255 p. $8.

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U. S. DEPT. OF COMMERCE. NATIONAL BUREAU OF STANDARDS. X-ray protection. Washington, Govt. Print. Off., 1955. 41 p. $0.20.

U. S. PUBLIC HEALTH SERVICE. The physician in the U. S. Public Health Service. Washington, Govt. Print. Off., 1955. 20 p. $0.15.

WACHTEL, H. I., ed. Security for all and free enterprise; a summary of the social philosophy of Josef Popper-Lynkeus. New York, Philosophical Library, 1955. 162 p. $3.

WILD, HEINRICH. Two-step injection with hyaluronidase, an essential improvement of local anesthesia. (Reprinted from Odontologisk Revy Vol. 5, p. 262-296). Lund, 1954.

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YEAR BOOK OF DENTISTRY, 1955-1956. Chicago, Year Book Publishers, 1956. 461 p. $6.

Requisites of a Good Scientific Paper • To crystallize successfully one's researches into a concise, lucid, well organized and well illustrated paper is an achievement limited to few investigators. Such a publication results in intellectual gratification to both author and reader. To read and study well written papers is a joy for which the reader is always appreciative. A good scientific paper, first, contains new data well oriented among those already in the literature and, second, accurately evaluates the new contributions. It indicates the purpose of the investigation, describes the experiments, and presents precisely the origin of the ideas. The results are summarized clearly but without modification, selection, or elimination of data for the purpose of reaching preconceived, prejudiced or apparently acceptable conclusions. The arguments by which the interpretations were logically and clearly made are included in the paper, to permit the readers to judge all aspects. *George E. Burch, Of Publishing Scientific Papers, 1954, p. 5.*

COUNCIL ON DENTAL EDUCATION

Dental and dental hygiene students: their characteristics, finances and practice plans

VI. Sources of funds of dental students

Attendance at dental school is financed with funds drawn from a variety of sources (Fig. 26 and Table 33). Of the estimated $11,814 spent by the average dental student to meet expenses during his four years at school, the greater part ($10,215 or 86 per cent) came from sources which may be categorized as "within the family." Included in this category was $4,299 from parents, $2,480 from wife's earnings, $2,047 from savings and $1,389 from income received by the student for employment during the school year. The sources which supplied the remaining 14 per cent include veteran benefits ($673), scholarships ($137), school loans ($68), other loans ($430), and the variety of undesignated sources grouped together under the heading "other" ($291).

SOURCES OF FUNDS

The proportion of students reporting funds from different sources is graphically presented in Figure 27. About 72 per cent of all students received gifts or loans from parents, and a like proportion drew upon their savings to meet expenses during the school year. On the other hand, more than one third of all funds used by the average student were received from parents and about one sixth came from savings (Fig. 26). Although one half of all students reported earnings during the year, these funds comprised only slightly more than one tenth of all expenditures. Less than one third of the students reported wife's earnings as a source of funds. The amounts so derived, however, corresponded to more than one fifth of all monies reported. Even for the remaining five sources, which in the aggregate represented only 13 per cent of all expenditures, the proportion of students reporting some help therefrom was substantial. Veteran benefits were reported by 15 per cent of the students, scholarships were received by 8 per cent, and 4 per cent borrowed money from school loan-funds during the year. One student in eight reported "other loans," while one in five classified some of the funds under the miscellaneous heading "other."

Concealed within these sample averages is a broad range of patterns describing financing by individual students. Although 72 per cent reported funds from parents, the aid so received ranged from only minor fractions of the cost to almost the total amount spent during the year. Similarly, only one third reported wife's earnings, but such funds, when available, usually represented the source from which substantial fractions of all school and living costs were met. The average student reported funds from three sources, but those which were most important to individual students and the combinations in which they were used, fail to conform to any common pattern or patterns. On the other hand, averages do reflect differences between broad

This is Chapter 6 of a report of a cooperative study made by the Council on Dental Education of the American Dental Association and the Division of Dental Resources of the United States Public Health Service.

Text of this report was prepared by Walter J. Pelton, D.D.S., M.S.P.H.; Quentin M. Smith, D.D.S.; Elliott H. Pennell; Ruth D. Bothwell, and James N. Ake, Washington, D. C.

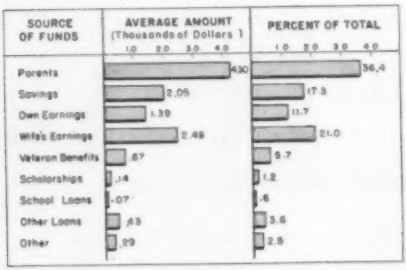

Fig. 26 • Distribution of average four year expenditures by source of funds: 1953-1954

groups of students which seem highly significant.

Differences Associated with Year in School • There were important differences in the extent to which the various fund-sources were used by students in the four class groups. Monies obtained from parents, from savings, and from veteran benefits, were substantially less for seniors than for freshman students. Conversely, income from student employment and from wife's earnings were substantially greater. The use of scholarship funds, school loans, and other loan funds, also increased, but such sources at no time represented any substantial fraction of total expenditures for the average student. On the other hand, it is likely that such sources may have represented substantial amounts for some students and thus contributed greatly in individual cases to payment of school and living costs.

As in the case of average amounts, the proportion of students reporting use of different fund-sources varied with year in school. Three fourths of all freshmen as contrasted with 64 per cent of seniors received some aid from parents. The fraction using savings likewise declined from 81 to 57 per cent. On the other hand, there were substantial increases in the proportion drawing funds from earnings, scholarships and loan funds. The suggestion seems inherent in these data that, as savings become depleted, there is a tendency for more and more students to supplement their savings with greater earnings from outside work and increased use of scholarships and borrowed funds.

Differences Associated with Marital Status • Differences in marital status and living arrangements, with their im-

Table 33 • Distribution of total expenditures of dental students by year in school and source of funds: 1953-54

Year in school	Number of students	Source of funds									
		Total	Parents	Savings	Own earnings	Wife's earnings	Veteran benefits	Scholarships	School loans	Other loans	Other
					Amount						
Freshman	2,371	$2,730	$1,146	$ 633	$ 172	$ 396	$197	$ 30	$ 8	$ 77	$ 71
Sophomore	2,393	3,024	1,212	574	290	555	172	34	9	104	74
Junior	2,470	3,009	1,086	438	398	708	149	33	19	104	74
Senior	2,287	3,051	855	402	529	821	155	40	32	145	72
4-year total	9,521	11,814	4,299	2,047	1,389	2,480	673	137	68	430	291
					Per cent						
Freshman	2,371	100.0	42.0	23.2	6.3	14.5	7.2	1.1	0.3	2.8	2.6
Sophomore	2,393	100.0	40.1	19.0	9.6	18.4	5.7	1.1	0.3	3.4	2.4
Junior	2,470	100.0	36.1	14.6	13.2	23.5	5.0	1.1	0.6	3.5	2.4
Senior	2,287	100.0	28.0	13.2	17.3	26.9	5.1	1.3	1.0	4.8	2.4
4-year total	9,521	100.0	36.4	17.3	11.7	21.0	5.7	1.2	0.6	3.6	2.5

portant impact on living costs, bring to bear a variety of influences and limitations which impose widely different patterns of financing attendance at school. In this analysis, it seemed appropriate to emphasize especially the effect of the presence or absence of dependent children within the households of married students. This factor appeared to affect only nominally the pattern of student living expense and to have little or no bearing on the distribution of school expense items. Its effect on the extent to which alternate sources of funds are utilized by married students, however, is clearly evident from the altered fiscal arrangements which characterized the two groups of married students.

More than 85 per cent of all single students reported receipt of funds from parents to help defray school and living costs. Only 57 per cent of married students with dependent children and one half of those without children reported funds from this source. Similarly, three fourths of the single students as contrasted with approximately two thirds of the married students reported use of savings. Although only small proportions of students were involved in each case, single students generally reported scholarships more frequently than did married students. On the other hand, both groups of married students, and particularly those with children, reported funds from earnings during the school year, veteran benefits and loan funds much more frequently than did single students. Furthermore, 90 per cent of those without children and more than one half of those with children reported wife's earnings. In contrast, one third of the married students with children reported receipt of veteran benefits, 8 per cent reported school loans and one fifth reported "other loans." These proportions were twice as great as were those reported by other married students and were even more largely in excess of the percentages for single students.

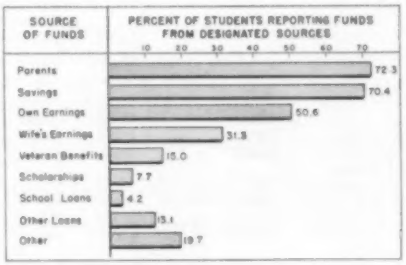

Fig. 27 • Per cent of dental students who reported receipt of funds from specific sources: 1953-1954

Amounts received from parents are particularly important in financing dental education for single students living away from home. For this group, the amount so contributed, either as gifts or loans, averaged $6,094 and represented about three fifths of the full cost of education for these students (Fig. 28, Table 34). For other single students, funds from this source are also large in amount ($4,304) and represent half of all funds used. Parents' contribution to school and living costs are much less for married students, both in total amounts and in the proportion which they represent of the total. The average for married students with no dependent children is only $2,118, or about 15 per cent of the total. Although the presence of dependent children in the home is associated with some increase in this contribution, the amount in such cases reaches only $3,027 or about one fifth of the total.

Savings, which were reported as a source of funds by a large fraction of the students in each category, served to defray a substantial portion of all expenditures. Nearly $2,000 was drawn from this source by the average single student. For those living at home, this represents nearly one fourth of all funds used, while for those away from home, it corresponds to slightly less than one fifth of the four-year costs. Married students without de-

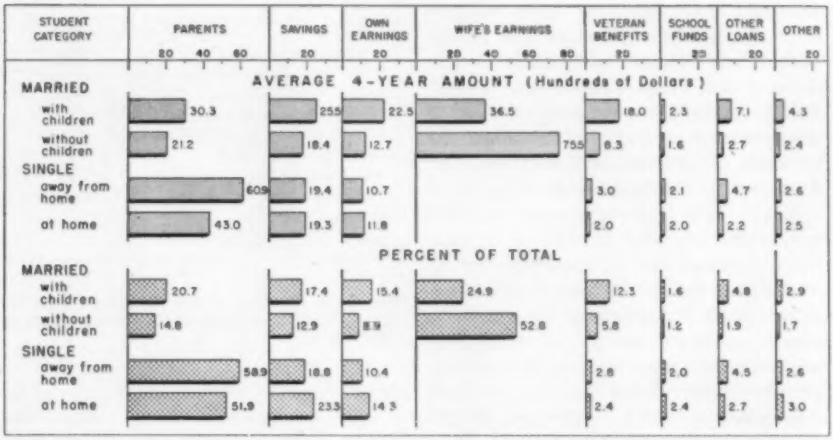

Fig. 28 • Distribution of average four year expenditures of selected categories of students, by source of funds: 1953-1954

pendent children drew only slightly less from savings while those with children used more. Because of the higher over-all total cost of attendance at school for married students, the proportionate share borne by savings is less than for single students.

The average earnings of "all students," $1,389, exceed somewhat the earnings reported by each group of single students and by those married students who have no dependent children. Married students with one or more children, on the other hand, relied on their own earnings to the extent of $2,252, an amount which exceeded the earnings of any other category of student by about $1,000. The earnings of wives of married students contributed substantially toward covering the cost of attending school. Where there were no children in the household, this item alone averaged $7,546, a major portion of the total four year cost. In families with dependent children, however, the average amount earned by wives was reduced to $3,645, or less than half the earnings of those without such responsibilities. Partially as a result, students who have children draw on their savings to a substantially greater extent than do other married or single students.

Funds drawn as veteran benefits in four years were only $201 for single students living with parents and $295, or about 50 per cent more, for other single students. For married students without children, however, the amount available from this source increased to $825, and for those with dependent children, it reached $1,796. Veteran benefits, on the average, made up only 6 per cent of all funds, but their contribution was doubtless of very material assistance to many students. From a low of approximately 2 per cent of all funds used by single students living at home, they reached a level equivalent to about 12 per cent of all funds available to married students with dependent children.

Although scholarships, loans and "other" sources did not represent a large share of the money spent by students in any of the four categories, the amount obtained from these sources was greater for married students with dependent children than for any other group.

Table 34 • Distribution of average four year expenditures by student category and source of funds: 1953-54

Student category	Number of students	Source of funds									
		Total	Parents	Savings	Own earnings	Wife's earnings	Veteran benefits	Scholarships	School loans	Other loans	Other
					Amount						
Married—											
with children	2,021	$14,631	$3,027	$2,551	$2,252	$3,645	$1,796	$120	$110	$705	$425
without children	2,144	14,281	2,118	1,843	1,274	7,546	825	108	54	269	244
Single students—											
away from home	3,825	10,341	6,094	1,941	1,073	—	295	145	64	465	264
at home	1,531	8,295	4,304	1,933	1,183	—	201	178	25	223	248
					Per cent						
Married students—											
with children	2,021	100.0	20.7	17.4	15.4	24.9	12.3	0.8	0.8	4.8	2.9
without children	2,144	100.0	14.8	12.9	8.9	52.8	5.8	0.8	0.4	1.9	1.7
Single students—											
away from home	3,825	100.0	58.9	18.8	10.4	—	2.8	1.4	0.6	4.5	2.6
at home	1,531	100.0	51.9	23.3	14.3	—	2.4	2.1	0.3	2.7	3.0

Differences Associated with Presence or Absence of Parental Assistance • The data presented in the previous section clearly indicate that students depend largely on "within the family" sources for funds to meet the costs of their dental education. For many students, and particularly for those who are single, gifts or loans from parents represent the largest single resource. In Figure 29 (Table 35) data for students in each category have been further divided to reveal the alternate patterns of financing which characterize students receiving aid from parents as contrasted with students receiving no funds from this source. The average four year expenditures for each category of student appear to be altered but little when this reclassification is carried out. On the other hand, the patterns of financing are greatly changed. For married students with children, the group with aid from parents received $5,400 from this source in four years. For those without such assistance, this was balanced for the most part by expanded amounts from other "within the family" sources. Additional amounts used from savings, own earnings and wife's earnings were $800, $1,200 and $2,400, respectively. Veteran benefits, which were $1,300 greater, represent the only other item in which there was any material change. Married students without dependent children who received aid from parents reported amounts from parents which averaged $4,300. For other married students this was made up by increases in amounts from own and wife's earnings and from veteran benefits. For single students receiving parental assistance, the amount in four years was $6,900 for those away at school and $5,000 for those living at home. For both of these groups, the largest shares were made up from savings and from student earnings during the year, but veteran benefits, scholarships, loan funds and other sources played a somewhat greater role than for married students.

Differences Between Public and Private Schools • Generally, somewhat smaller amounts were drawn from each designated source to finance the slightly lower expenditures of students in public schools as contrasted with those in private schools

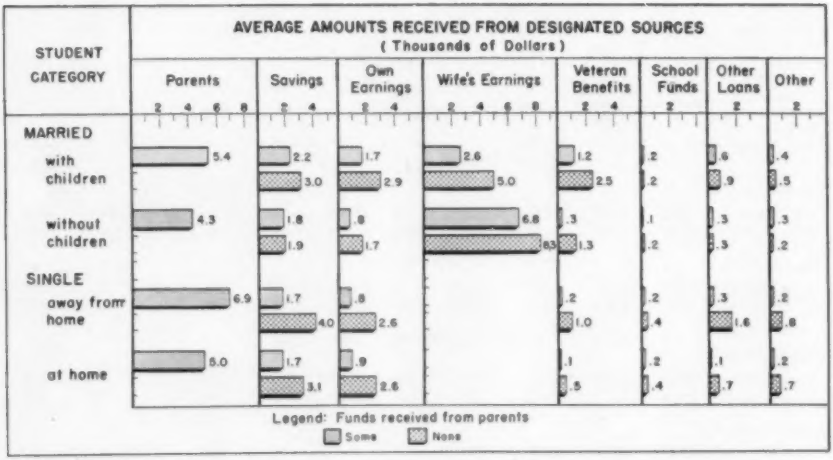

Fig. 29 • Distribution of average four year expenditures of selected categories of students, who received some or no funds from parents, by source of funds: 1953-1954

(Fig. 30 and Table 36). The extent of differences varies somewhat from item to item, but for any single source the difference is not very large.

The greatest divergence between the four year average amounts from any designated source is apparent in funds received from parents by single students.

Table 35 • Distribution of four year expenditures by student category, presence or absence of parental assistance and source of funds: 1953-54

Student category and funds received from parents	Number of students	Source of funds									
		Total	Parents	Savings	Own earnings	Wife's earnings	Veteran benefits	Scholarships	School loans	Other loans	Other
		Amount									
Married—with children											
Some	1,145	$14,411	$5,415	$2,221	$1,733	$2,617	$1,233	$115	$108	$593	$376
None	876	14,925	—	2,965	2,919	4,969	2,497	125	109	862	479
without children											
Some	1,053	14,618	4,301	1,757	803	6,766	316	85	52	264	274
None	1,091	13,957	—	1,910	1,718	8,315	1,342	130	56	273	213
Single students—away from home											
Some	3,376	10,348	6,937	1,681	834	—	203	126	58	318	189
None	449	10,262	—	3,955	2,564	—	1,012	248	115	1,545	823
at home											
Some	1,310	8,333	5,048	1,727	931	—	123	151	23	145	185
None	221	7,940	—	3,126	2,596	—	525	338	41	661	653

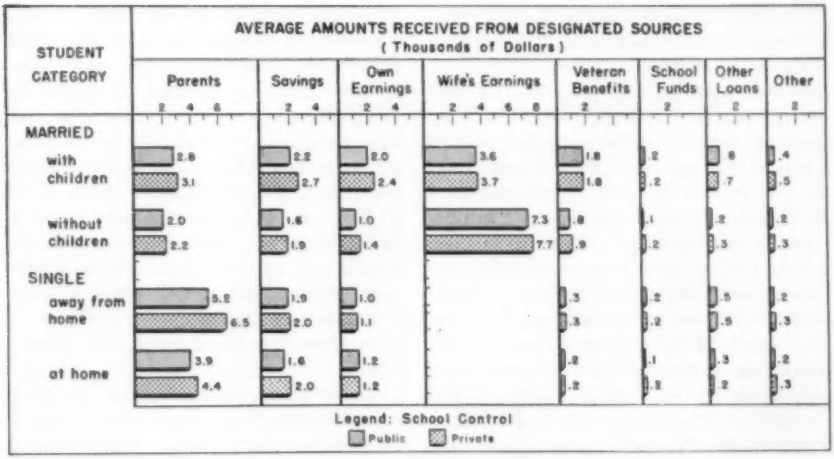

Fig. 30 • Distribution of average four year expenditures of selected categories of students, by type of school attended and source of funds: 1953-1954

For those living away from home, the average contribution from parents was $1,347 less for those in public schools than for those in private, but for those living with their parents the difference was only $440. Single students at home also spent $335 less from savings and $168 less from scholarships when attending public schools. Conversely, those living away from home spent $145 less from

Table 36 • Distribution of average four year expenditures by student category, school control and source of funds: 1953-54

Category of student and type of school	Number of students	Source of funds									
		Total	Parents	Savings	Own earnings	Wife's earnings	Veteran benefits	Scholarships	School loans	Other loans	Other
Married students with children											
Public	674	$13,794	$2,801	$2,194	$2,016	$3,564	$1,847	$ 95	$129	$796	$352
Private	1,347	15,043	3,134	2,721	2,373	3,689	1,771	131	100	662	462
without children											
Public	720	13,258	2,004	1,646	997	7,320	755	35	64	238	199
Private	1,424	14,796	2,178	1,930	1,412	7,653	880	145	46	286	266
Single students away from home											
Public	1,145	9,237	5,151	1,896	972	—	267	117	90	501	243
Private	2,680	10,814	6,498	1,957	1,117	—	308	158	53	450	273
at home											
Public	205	7,448	3,923	1,642	1,187	—	163	33	25	260	215
Private	1,326	8,426	4,363	1,977	1,184	—	208	201	26	217	250

earnings. Although numerous other small differences were apparent, the amounts were less than $100.

Differences for married students were distributed over a larger number of fund sources. For the most part, the savings accrued through the lower expenditures in public schools were largely reflected in smaller amounts used from sources "within the family." When attending public rather than private schools, students with dependent children spent about $500 less from savings, between $300 and $400 less from earnings and from funds received from parents, about $100 less from wife's earnings and "other" funds and about $100 more from veteran benefits and from loans. For other married students, the corresponding differences were $415 less from earnings, about $300 less from savings and wife's earnings, and approximately $100 less in each case from parents, from veteran benefits and from scholarships.

Differences Associated with Veteran Status • Even though the amount of money received as veteran benefits averaged only $673 per student, monies from this source made a very substantial contribution to the amounts expended by different categories of veterans who were in school in 1953-54. The average amounts varied from $2,545 for married veterans with dependent children to $1,245 for single veterans who lived at home with their parents throughout the four years in school. It should be recalled that these students, as a group, were older than nonveterans and had established independent homes to a much greater degree.

The extent to which financing patterns for different categories are altered by the factors associated with attendance at school following periods of military service is indicated by data presented in Figure 31 and Table 37. For all student categories, veterans as contrasted with nonveterans utilized funds more largely from savings, from their own and from their wives' earnings, from veteran benefits, and from loan funds. Nonveterans, on the other hand, realized much greater

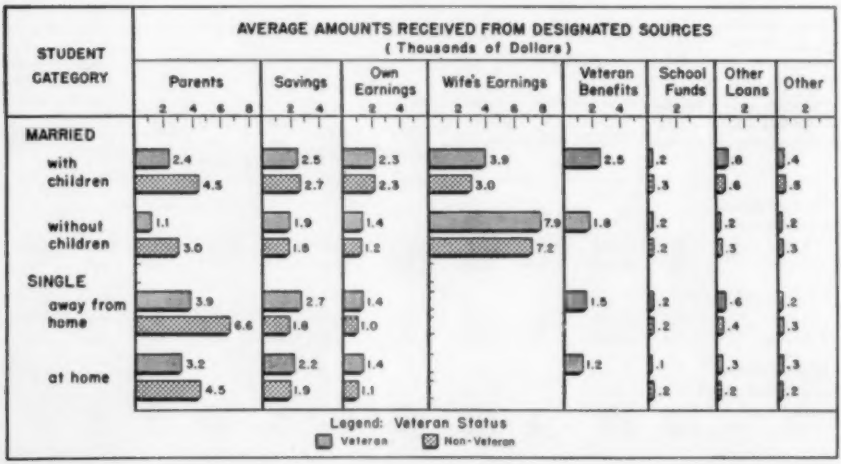

Fig. 31 • Distribution of average four year expenditures of selected categories of students, by veteran status and source of funds: 1953-1954

amounts as loans or gifts from parents. Although scholarships represent but a minor source of income for the average student, the amounts received by nonveterans were greater than were those received by veterans. Inspection of the data indicates that, aside from amounts received as veteran benefits, the largest part of the differences between funds which were available to the two student groups were concentrated in funds from "within the family." Both categories of married nonveteran students received nearly $2,000 more from parents than did veterans. Single nonveterans received $1,400 more when living at home and $2,700 when away from home. Nonveterans with dependent children spent slightly more from savings and earnings than did veterans in the same category; but, for each of the other three student categories, expenditures from these two sources by veterans were considerably in excess of those by nonveterans. Both categories of married veteran students reported substantially greater amounts from wife's earnings.

Regional Differences • The extent to which different sources were drawn on by students in financing their dental education varied greatly from one geographic region to another. The averages reported by all students in each of the four broad regions of the country are presented in Figure 32 (Table 38).

Funds made available by parents of students exceeded those from any other single source in each region of the country except the West. In that area, wife's earnings made a larger contribution. This doubtless reflects the influence of the large number of married students reporting data from schools in this area. The amounts from parents were greatest in the Northeast and South with averages of $4,949 and $4,599, respectively. Students in the West received $3,447 from parents, while in the North Central states they received $3,843. The Northeastern region also led all others in the extent to which savings were utilized, but students in the North Central and Western states used such funds to only a slightly lesser degree. In the South, the

Table 37 • Distribution of average four year expenditures by student category, veteran status and source of funds: 1953-54

Category of student and veteran status	Number of students	Source of funds									
		Total	Parents	Savings	Own earnings	Wife's earnings	Veteran benefits	Scholarships	School loans	Other loans	Other
Married students with children											
Veteran	1,461	$14,963	$2,405	$2,465	$2,269	$3,920	$2,545	$103	$110	$762	$384
Nonveteran	560	13,834	4,455	2,743	2,296	2,984	—	166	105	559	526
without children											
Veteran	1,047	14,747	1,117	1,931	1,366	7,933	1,784	95	71	238	212
Nonveteran	1,097	13,847	2,965	1,788	1,191	7,192	—	122	33	288	268
Single students away from home											
Veteran	799	10,588	3,898	2,738	1,356	—	1,532	122	82	629	231
Nonveteran	3,026	10,261	6,623	1,751	999	—	—	152	56	408	272
at home											
Veteran	257	8,817	3,182	2,244	1,426	—	1,245	106	30	282	302
Nonveteran	1,274	8,195	4,537	1,880	1,134	—	—	193	21	194	236

average of $1,551 from savings was lower than in any other region. Amounts used from earnings of wives varied between regions, ranging from $1,772 in the Northeast to $3,806 in the West. Veteran benefits were lowest in the Northeast, highest in the West. Use of scholarships was relatively greatest in the Northeast and lowest in the West. Loans in the largest amount were reported from the South and the West.

The figures indicate that large and important differences exist in the relative extent to which different sources of funds are utilized by students in different locations. It is also apparent that the differences which characterize total expenditures from region to region are not reflected in any orderly way in the extent to which different fund sources are utilized. The differences noted, to some extent at least, are attributable to differences in the proportions of single and married students which characterize student bodies in the different regions.

Indebtedness • The heavy expenses associated with attendance at dental school require many students to supplement their resources through loans obtained from a variety of sources. The variation in arrangements resorted to by students in financing their dental school training is evident from information presented in the preceding sections on sources of funds. These data, however, cannot be translated into summary estimates of indebtedness since a summation of loans reported while attending dental school would exclude all indebtedness incurred by students prior to their matriculation in dental school. Moreover, the degree to which students had assumed obligations for repayment could not be accurately assessed with respect to some of the items.

In order to make a more accurate evaluation of the current financial status of dental students, each student was asked to report his estimated total indebtedness as of the end of the study year. The survey was conducted late in the Spring near the end of the term, and it was assumed that the student would have sufficient knowledge of his expenses to report indebtedness with reasonable accuracy. Criteria for defining indebtedness unquestionably differed from student to student, but it is believed that the reports reflect indebtedness insofar as there is a clear assumption of responsibility for repayment. Certainly, in the case of funds received from parents and from other relatives, the obligation to repay is often not clear cut. Undoubtedly, in many instances, funds from this source reported by students as indebtedness will neither be repaid nor be expected to be repaid. On the other hand, some students who did not report such funds as debts may later, under certain circumstances, feel obligated to repay in part or in full and may indeed be expected to do so. Failure to report any amount under indebtedness was assumed to be tantamount to no indebtedness, although in some instances it may actually represent an oversight. With the limitations so implied, it is believed that the reports received are of interest as a basis for estimating indebtedness which accrues through the entire course of study leading to the dental degree.

Reports of senior students indicate that only 43 per cent of all dental students complete their schooling without incurring some indebtedness. The amounts reported in many cases exceeded $10,000. Of all seniors included in the study, 14 per cent reported debts that totaled $6,000 or more, 23 per cent amounts between $2,000 and $5,999, and another 20 per cent amounts of $2,000 or less.

The progressive nature of the accrual which takes place with each advancing class is indicated in Table 39. Successively smaller proportions were either without debt or had incurred only limited indebtedness, while those owing substantial amounts made up an increasingly

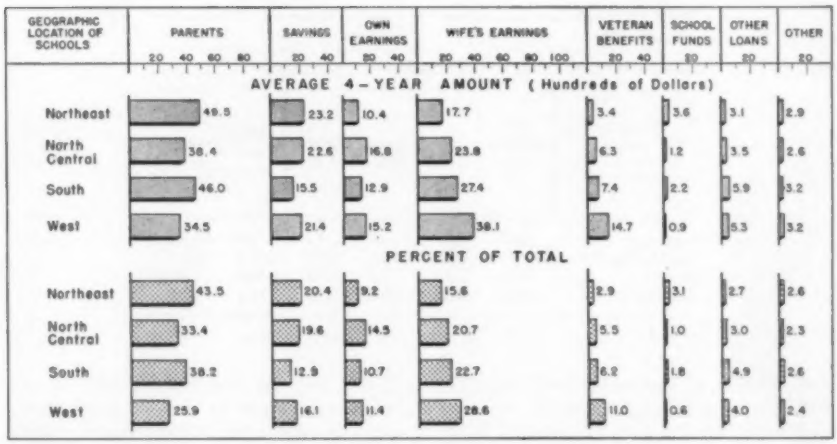
GEOGRAPHIC LOCATION OF SCHOOLS
PARENTS
SAVINGS
OWN EARNINGS
WIFE'S EARNINGS
VETERAN BENEFITS
SCHOOL FUNDS
OTHER LOANS
OTHER
AVERAGE 4-YEAR AMOUNT (Hundreds of Dollars)
Northeast 49.5 23.2 10.4 17.7 3.4 3.6 3.1 2.9
North Central 38.4 22.6 16.8 23.8 6.3 1.2 3.5 2.6
South 46.0 15.5 12.9 27.4 7.4 2.2 5.9 3.2
West 34.5 21.4 15.2 38.1 14.7 0.9 5.3 3.2
PERCENT OF TOTAL
Northeast 43.5 20.4 9.2 15.6 2.9 3.1 2.7 2.6
North Central 33.4 19.6 14.5 20.7 5.5 1.0 3.0 2.3
South 38.2 12.9 10.7 22.7 6.2 1.8 4.9 2.6
West 25.9 16.1 11.4 28.6 11.0 0.6 4.0 2.4

Fig. 32 • Distribution of average four year expenditures by region and source of funds: 1953-1954

large proportion of the total. About 60 per cent of the freshmen were free of debt, but this proportion declined to 43 per cent for those in the senior year. The average amount owed by those freshmen having debts was $2,193, and this value gradually increased to $4,230 for seniors at time of graduation.

Differences Between Public and Private Schools • Relatively more students who were about to graduate from public schools reported some indebtedness than was the case for those completing their training in private schools. Approximately 60 per cent of the seniors in public schools were in debt, as compared with 54 per cent of those in private schools (Table 40). The latter group of students, however, reported greater amounts. The average amount owed by students with debts was $4,436 for those attending pri-

Table 38 • Distribution of average four year expenditures by region and source of funds: 1953-54

Geographic location of school	Number of students	Source of funds									
		Total	Parents	Savings	Own earnings	Wife's earnings	Veteran benefits	Scholarships	School loans	Other loans	Other
					Amounts						
Northeast	2,271	$11,384	$4,949	$2,323	$1,044	$1,772	$336	$325	$ 38	$305	$292
North Central	3,408	11,515	3,843	2,255	1,677	2,382	631	58	58	349	262
South	2,936	12,042	4,599	1,551	1,292	2,735	741	114	106	586	318
West	906	13,321	3,447	2,144	1,515	3,806	1,469	33	60	530	317
					Per cent						
Northeast	2,271	100.0	43.5	20.4	9.2	15.6	2.9	2.8	0.3	2.7	2.6
North Central	3,408	100.0	33.4	19.6	14.5	20.7	5.5	0.5	0.5	3.0	2.3
South	2,936	100.0	38.2	12.9	10.7	22.7	6.2	0.9	0.9	4.9	2.6
West	906	100.0	25.9	16.1	11.4	28.6	11.0	0.1	0.5	4.0	2.4

Table 39 • Per cent of students reporting indebtedness of designated amounts: 1953-54

Year in school	All students	Amount of indebtedness				Average amount reported by students having indebtedness
		None	Under $2,000	$2,000-5,999	$6,000 and over	
Freshmen	100.0	60.2	25.4	11.7	2.7	$2,193
Sophomores	100.0	52.3	22.0	19.1	6.6	3,113
Juniors	100.0	50.1	20.0	19.4	10.5	3,745
Seniors	100.0	43.4	20.0	22.6	14.0	4,230

vate schools, as contrasted with only $3,922 for those in public schools.

Differences Associated with Marital Status • The greatest indebtedness reported was by seniors who were single students living away from home (Table 41). The average value for these students was $5,232, and 56 per cent of the group owed some money. Although married senior students were slightly more likely to be in debt, the amounts they owed were considerably less ($4,048). As might be expected, single students living at home with parents were least likely to be in debt. Forty-three per cent of the senior students in this group reported debts which averaged $3,411.

Regional Differences • Indebtedness was reported by seniors in the Northeast with less frequency than in any other region (Table 42). In that region, only 42 per cent owed money at time of graduation, while in each of the other three regions the proportion was 60 or 61 per cent. For those reporting in the Northeast, the average indebtedness, however, was $4,414, an amount which was not appreciably lower than the highest average reported ($4,457 in the South). Seniors reported lowest average values in the North Central states ($3,981), and in the West, the average ($4,261) was intermediate in amount.

CONCLUSION

Student financing of dental school attendance is largely accomplished with funds obtained from "within the family" sources. More than one third of the total funds used in 1953-54 was obtained as gifts or loans from parents, slightly less

Table 40 • Per cent of senior students reporting indebtedness of designated amounts, by form of school control: 1953-54

Type of school	All students	Amount of indebtedness				Average amount reported by students having indebtedness
		None	Under $2,000	$2,000-5,999	$6,000 and over	
Public	100.0	39.6	22.5	25.4	12.5	$3,922
Private	100.0	45.7	18.5	20.9	14.9	4,436

Table 41 • Per cent of senior students reporting indebtedness of designated amounts, by category of student: 1953-54

Category of student	All students	Amount of indebtedness				Average amount reported by students having indebtedness
		None	Under $2,000	$2,000-5,999	$6,000 and over	
Single students living with parents	100.0	57.2	20.0	15.2	7.6	$3,411
Single students with other living arrangements	100.0	43.6	15.0	20.4	21.0	5,232
Married students	100.0	40.3	21.6	25.3	12.8	4,048

than one third came from savings or income earned during the year and one fifth was reported as wife's earnings. The balance included nearly 6 per cent from veteran benefits and 8 per cent distributed as small shares from scholarships, loans and "other" sources. Changes in financing patterns with year in school suggest that savings become progressively less available, and there is a tendency for more and more students to supplement savings with greater earnings from outside work and increased use of scholarships and borrowed funds.

Single students depend most largely on income from parents, more than one half of all their funds being drawn from this source. On the other hand, income from working wives represents the largest single source of funds for married students. Where there are no dependent children in the household, these earnings finance more than one half of all school and living costs. For these students, the amount received from parents is reduced far below that reported by single students while amounts from savings and earnings are not materially changed. The presence of children in the home, however, reduces the amount from wife's earnings to only one fourth of the total funds used. This reduction is balanced by substantial increases in amounts from all "within the family" sources. For this group of students, veteran benefits are substantial in amount, and loans and "other" sources are more important than for any other category of student.

Table 42 • Per cent of senior students reporting indebtedness of designated amounts, by region: 1953-54

Geographic location of school	All students	Amount of indebtedness				Average amount reported by students having indebtedness
		None	Under $2,000	$2,000-5,999	$6,000 and over	
Northeast	100.0	57.7	14.2	16.9	11.2	$4,414
South	100.0	38.5	20.0	25.8	15.7	4,457
North Central	100.0	39.4	22.8	24.1	13.7	3,981
West	100.0	39.5	22.2	21.6	16.7	4,261

Absence of parental aid is reflected in increased amounts drawn from almost every fund source. By far the greatest share of these increases are from other "within the family" sources. Veteran students, in addition to their veteran benefits, draw slightly larger amounts than nonveterans from every source except from parents. In that area, they receive substantially less than nonveterans.

Indebtedness of students increases with year in school. From 40 per cent of all freshmen with indebtedness, the share reaches 60 per cent by the senior year. The average owed per student reporting indebtedness increases from $2,193 to $4,230 over the four years spent in dental school.

COUNCIL ON DENTAL TRADE AND LABORATORY RELATIONS

Illinois Supreme Court decision in laboratory suit

On March 22, 1956, the Supreme Court of Illinois issued its decision in the litigation initiated by the Chicago Dental Society against a number of dental laboratories. The dental society had charged the defendant laboratories with practicing dentistry and advertising their services in violation of the Illinois Dental Practice Act. The Supreme Court affirmed the issuance of an injunction against the defendant laboratories prohibiting them from dealing direct with the public and imposing appropriate restrictions on their advertising programs. The Illinois court swept aside the defendants' contention that certain sections of the Illinois law were unconstitutional and, significantly, refused to follow the recent decision of the Idaho Supreme Court which permits dental technicians to duplicate, repair and reline dentures directly for members of the public in that state. The Illinois decision should be of interest to every member of the Association, since it supports the Association's position that the complete legal responsibility for providing prosthetic dental services to members of the public should rest with the dental profession.

Walter E. Dundon, D.D.S., chairman
Council on Dental Trade and Laboratory Relations

OPINION OF THE SUPREME COURT OF ILLINOIS

The People *ex rel.* Chicago Dental Society *et al.*, Appellees, v. A. A. A. Dental Laboratories, Inc., *et al.*— (A-1 Dental Plate Laboratory Company, Inc., *et al.*, Appellants.) Docket No. 33718; filed March 22, 1956

MR. JUSTICE SCHAEFER delivered the opinion of the court:

In this case those provisions of the Dental Practice Act which relate to persons who manufacture and repair substitutes for natural teeth are challenged upon many constitutional grounds.

The action was instituted in the superior court of Cook County on the relation of the Chicago Dental Society and a number of its officers, directors and members against 36 persons, groups of persons or corporations engaged in the dental laboratory business in Chicago. The amended complaint charged the de-

fendants with practicing dentistry without licenses, soliciting dental patronage from the public by advertising and practicing dentistry under the name of a corporation, company, association or trade name, all in violation of the Dental Practice Act. The relief sought was a permanent injunction restraining defendants from violating the act.

The statute provides a comprehensive scheme of regulation of the practice of dentistry. The controversy centers primarily upon sections 5a and paragraphs (8) and (9) of section 5. Section 5 provides that a person practices dentistry "(8) Who takes impressions of the human tooth, teeth, or jaws or performs any phase of any operation incident to the replacement of a part of a tooth, a tooth, teeth or associated tissues by means of a filling, a crown, a bridge, a denture or other appliance; or

"(9) Who furnishes, supplies, constructs, reproduces or repairs, or offers to furnish, supply, construct, reproduce or repair prosthetic dentures (sometimes known as 'plates,') bridges or other substitutes for natural teeth, to the user or prospective user thereof." Ill. Rev. Stat. 1955, chap. 91, par. 60.

The portion of section 5a which is most sharply disputed provides: "Licensed dentists may employ or engage the services of any person, firm or corporation to construct or repair, extra-orally, prosthetic dentures, bridges, or other replacements for a part of a tooth, a tooth, or teeth. A person, firm or corporation so employed or engaged, when constructing or repairing such dentures, bridges or replacements, exclusively, directly and solely for licensed members of the dental profession, and not for the public or any part thereof, shall not be deemed or considered to be practicing dentistry as defined in this Act." The remainder of the section restricts the advertising activities of persons, firms and corporations so engaged. Ill. Rev. Stat. 1955, chap. 91, par. 60a.

The effect of these provisions is to make it unlawful for dental laboratory technicians to take impressions for false teeth, or to make or repair them, except when engaged or employed to do so by a licensed dentist.

By motions to dismiss the amended complaint, certain defendants attacked the Dental Practice Act on constitutional grounds. An order was entered on the motions to dismiss which found section 5a unconstitutional to the extent that it prohibited defendants from selling prosthetic dentures (plates), bridges, or other substitutes for natural teeth directly to the user or prospective user, where the patient employs a licensed dentist who takes the necessary impressions, gives an order or prescription therefor, and makes the fitting thereof in the oral cavity.

After defendants had answered, the cause was referred to a master in chancery who conducted extended hearings. On plaintiffs' motion the complaint was dismissed as to seven defendants or groups of defendants. Decrees granting injunctive relief were entered by consent against two defendants, and a default decree was entered against one. In accordance with the master's recommendation, the decree found that all but four of the remaining defendants were practicing dentistry without licenses and permanently enjoined them from the practices described in the decree. In accordance with the ruling made on the motions to dismiss, the decree provided that defendants might sell substitutes for natural teeth directly to users or prospective users when a licensed dentist takes the necessary impressions, gives an order or prescription therefor, and makes the fitting thereof in the oral cavity. The plaintiffs have cross-appealed from those portions of the decree which reflect this ruling. As to four defendants, the decree found the evidence insufficient to show that they constructed or repaired dentures, bridges or other replacements for human teeth except directly and solely for licensed dentists, and that their advertising did not violate any of the provisions of the Dental Practice Act. The complaint was dismissed as to them. One defendant died during the pendency of the litigation, and the complaint was dismissed as to him. Twelve defendants against whom decrees were entered prosecute this appeal; plaintiffs cross-appeal, and the appellants and the four defendants as to whom relief was denied are cross appellees.

Defendants' principal contention is that the statute deprives them of due process of law under the State and Federal constitutions. Voluminous testimony establishes beyond doubt that the furnishing of artificial dentures is intimately related to the general health of the patient, and that the mechanical work of making the denture is but a small part of the total undertaking, which always requires biological, physiological and pathological knowledge, and sometimes surgical skill. This relationship justifies legislative regulation of dentistry, including prosthetic dentistry (*Lasdon* v. *Hallihan*, 377 Ill. 187), and indeed the defendants concede in their reply brief that the legislature can regulate the activities of dental technicians.

It is argued, however, that although the general subject is within the legislative competence, the particular regulation is unreasonable, arbitrary and unrelated to concerns of public health. It is pointed out that under the act no qualifications are established for the laboratory technicians who make dental plates. Any per-

son may do so, and the only qualification, it is said, is that the work must be done through the brokerage of a dentist. It is argued that the dentist is thus given what amounts to governmental control over the laboratory technician, which may be exercised arbitrarily since no standards are prescribed. The technician is afforded no protection; his success is dependent upon the favor of the dentist.

We emphasize at the outset that decision does not depend on our appraisal of the wisdom of the enactment, and that "it is for the legislature, not the courts, to balance the advantages and disadvantages of the new requirments." (*Williamson* v. *Lee Optical of Oklahoma, Inc.* 348 U.S. 483, 487.) That we might regard certain provisions as unnecessary is immaterial if they can be said to be reasonably related to a legitimate legislative concern.

The aim of the statute is to restrict the practice of dentistry to licensed dentists with the exception that extra-oral work on dental appliances may be done by non-dentists who are engaged or employed by dentists to do it. To that end, dental technicians are prohibited to do work on dental appliances directly for the public. The evidence establishes that the knowledge and skill of the dentist is necessary in the diagnosis of the case, the taking of impressions, the issuance of instructions to the laboratory and the testing, fitting and adjustment of a prosthetic denture. It is argued, however, that the limit of legislative power is reached when the statute requires that the impression be made upon the order of a dentist who also fits the appliance into the oral cavity, and that the technician cannot be prohibited from selling the denture directly to the patient. This was the view taken by the trial court upon the motion to dismiss, and as has been stated, the plaintiffs have cross-appealed from those portions of the decree which reflect that ruling.

In our opinion the power of the legislature is not exhausted when it has provided that there shall be professional supervision at the inception and the conclusion of what is essentially a single process. It may, if it sees fit, go further and insure that responsibility to the patient shall not be fragmented, and it may focus that responsibility upon a member of the profession which it regulates. By that means, compliance with the requirement that the dentist shall fit the appliance in place and make the necessary adjustments may be enhanced, protection against inferior workmanship and materials and exorbitant prices may be ensured, and the dentist can be certain that the work for his patients is done by those in whose integrity, competence and skill he has confidence.

Advertising by dentists is severely restricted. The record in this case shows that many of the defendant technicians have by persistent and blatant advertising sought to deal directly with the public, and that control of dental patronage has thus come into the hands of laboratory technicians who have directed it to such dentists as they saw fit. Prohibition of direct dealing between the makers of dentures and the public may thus be thought desirable to avoid the danger that the profession of dentistry may become "subservient to the business of those engaged in the making of plates." *Lasdon* v. *Hallihan*, 377 Ill. 187, 195.

Lasdon v. *Hallihan* is decisive of the central issue in this case and of some of the peripheral issues as well. The statute which was before the court in that case provided that dental plates might, "under certain specified conditions, be made by one who is not a licensed and registered dentist. Such conditions are (a) the impression from which the plate is to be made must be taken by a licensed dentist; (b) the person engaged in the making of such appliances shall not offer to sell them or the services rendered in the construction of them to the public and (c) the placing and adjustment of the plates in the oral cavity shall be performed by a licensed dentist." (377 Ill. at 190.) The statute was sustained against attack upon the constitutional grounds here urged.

The defendants, however, urge that the *Lasdon case* was in effect overruled by our decisions in *People* v. *Brown*, 407 Ill. 565, and *Schroeder* v. *Binks*, 415 Ill. 192, or alternatively that the *Lasdon case* was wrongly decided. In the *Brown case* certain sections of the Plumbing License Law of 1935 were held unconstitutional. That act classified plumbers as master plumbers, journeymen plumbers and plumber's apprentices, and required a license for each classification. A journeyman plumber could carry on his work only under the supervision of a licensed master plumber. An apprentice could learn the plumbing trade only as an employee of a licensed master plumber. A journeyman plumber seeking a master plumber's license was required to show that he had been actually engaged by a master plumber for a prescribed period. An apprentice applying for a journeyman plumber's license was required to show that he was to be immediately employed by a master plumber. The court held that the act granted master plumbers a monopoly, and that it constituted an unwarranted exercise of the police power.

The Plumbing License Law of 1951, adjudged unconstitutional in *Schroeder* v. *Binks*, 415 Ill. 192, was vulnerable in large measure to the vices which infected the earlier Plumbing License Law. The provision of the former

statute requiring journeymen and apprentice plumbers to be employees of master plumbers was eliminated and a provision substituted requiring supervision by master plumbers of all plumbing work done by journeymen or apprentices. The substitution did not meet the prior objection. As we observed (415 Ill. at p. 197): "In all of this there is no suggestion that protection of the public health is enhanced by the requirement that all of the work of a licensed journeyman must be supervised by a master. Rather it appears that the roots of the requirement reach back to an economic pattern which is anachronistic today." In neither of the two cases was any attempt made to show the existence of economic evils which might have been thought to justify legislative action, and none were apparent.

There is in the present case no prescribed economic hierarchy, with access to each successive stage controlled by the dominant interest. Any person is free to become a dental laboratory technician. The statute places no artificial restraint upon him. His success is determined by the normal process of competition. By the statute his direct dealings are limited to those who are peculiarly fitted by education and training to judge the quality of his work. But in this restriction there may be protection for members of the public who lack the capacity to make an informed appraisal of the quality and value of the product, and protection as well for the economic independence of a profession serving public health needs. The General Assembly has regarded the limitation in the statute as necessary to protect the public and the dental profession, and we are unable to say that its determination is entirely without foundation. We adhere to our decision in *Lasdon* v. *Hallihan*, and we are not persuaded to the contrary by *Berry* v. *Summers*, 76 Ida. 374, 283 P.2d 1093, in which statutory provisions similar to those here involved were held invalid.

Defendants also attack the validity of sections 5(a) and 18(b) of the act (Ill. Rev. Stat. 1955, chap. 91, pars 60 (a), 72(b)), which limit the type of advertising which may be done by those who are subject to the act. The objection is not directed to any of the specific restrictions which the act contains. Rather it appears to be based upon the assumption that the General Assembly is without power to restrict in any way the advertising of dental laboratory technicians. The contrary has been squarely held. *Lasdon* v. *Hallihan*, 377 Ill. 187, 194; *Winberry* v. *Hallihan*, 361 Ill. 121; see also *Perlow* v. *Board of Dental Examiners*, — Mass. —, 127 N.E.2d 306; cf. *Williamson* v. *Lee Optical of Oklahoma, Inc.* 348 U.S. 483; *Klein* v. *Department of Registration and Education*, 412 Ill. 75; *Roberts Optical Co.* v. *Department of Registration and Education*, 4 Ill.2d 290.

Defendants further contend that subsections (8) and (9) of section 5 and section 5a violate section 13 of article IV of our constitution in that they contain matter not within the title of the Dental Practice Act, "An Act to regulate the practice of dental surgery and dentistry in the State of Illinois." Section 13 of article IV provides that no act shall embrace more than one subject, which shall be expressed in the title. The contention rests upon the argument that the making of false teeth is not the practice of dentistry, and that, not being "dental surgery" or "dentistry," provisions relating to this activity cannot properly be placed in the Dental Practice Act. The precise contention has been decided adversely to defendants. *Lasdon* v. *Hallihan*, 377 Ill. 187, 196.

Defendants make the additional contention that section 5(9) of the Dental Practice Act is special legislation of the character prohibited by section 22 of article IV of our constitution and the equal protection clause of the fourteenth amendment to the Federal constitution. This contention was also rejected in *Lasdon* v. *Hallihan*, 377 Ill. 187.

By their cross appeal, plaintiffs contend that, irrespective of the extent to which four of the defendants may have dealt with licensed dentists, the decree is erroneous in not enjoining them from advertising in telephone directories, by window posters, and by public display of specimen dentures, and from dealing directly with the public. The decree found as to Martin Dorner, doing business as Capitol Dental Laboratories, and also as Dorner Dental Laboratories, that he had carried one-quarter page display advertising in the Chicago Red Book since March of 1950, which included the following phrases: "New Tru-Fit Transparent Dental Plates—Emergency Repairs—Some Less Than 30 Minutes—Newest Types—Full or Partial Individualized Dentures Made By Master Technicians—All Plates Fitted With Gold Pin Teeth— 26 Years' Experience to the Dental Profession." A photograph shows that Dorner exhibited specimen dentures in the sidewalk show window of his laboratory. He also advertised in religious publications and in a theater. All of these forms of advertising are clearly prohibited by section 5(a), with the exception of the use of the telephone directory. As to that, the statute permits an announcement "by business card." The master found that Dorner came within the purview of section 5a but that he was not violating that section's provisions relating to advertising or announcements. This conclusion was predicated upon the interpretation that section 5a

contains "no limitation on the size of 'announcements' which can be made in a telephone directory." We disagree; the one-quarter page display advertisements referred to in the master's report and the decree amount to a "media calling attention of the public to their business," which is prohibited, rather than a "business announcement" which is permitted. This conclusion applies with like force to defendant's advertising in church publications and in the theater and to his display of specimen dentures in his shop window. While there is no evidence showing that this defendant dealt directly with the public, his advertising activities clearly show a purpose to do so, and in our opinion justify a decree restraining him from dealing directly with the public. The decree, so far as it relates to Dorner's advertising, and in so far as it fails to enjoin him from dealing directly with the public, is erroneous.

For the reasons stated concerning Martin Dorner, the decree is in part erroneous as it affects (1) Carl F. Dorner, doing business as Ogden Dental Laboratory, (2) Thomas P. Shanahan, doing business as Shanahan Dental Laboratories and West End Dental Laboratories, and (3) Comfort Plate Dental Laboratory.

In 19 paragraphs the injunctional orders contain the following exception: "except that defendant may sell said substitutes for natural teeth to the user or prospective user thereof where the user or prospective user thereof employs a licensed dentist who takes the necessary impressions therefor, and who gives an order or prescription therefor, and who makes the fitting thereof in the oral cavity." These parts of the decree adhere to the order entered on May 1, 1952, adjudging section 5a of the Dental Practice Act unconstitutional in part. For the reasons which have been stated, these portions of the decree are erroneous.

It becomes unnecessary to consider plaintiff's contention upon their cross appeal that the trial court erred in refusing to enforce *subpoenas duces tecum* to compel three of the defendants to produce books and records for examination before the master in chancery. The decree against two was substantially the same as the decree against the other defendants who are appellants here, and what has been said is applicable to these defendants. The third of these defendants is Carl F. Dorner, doing business as Ogden Dental Laboratory, whose situation has already been discussed.

The decree of the superior court of Cook County is reversed with respect to (1) Martin Dorner, doing business as Capitol Dental Laboratories and Dorner Dental Laboratories, (2) Carl F. Dorner, doing business as Ogden Dental Laboratory, (3) Thomas P. Shanahan, doing business as Shanahan Dental Laboratories and West End Dental Laboratories, and (4) Comfort Plate Dental Laboratory, and the cause is remanded as to them, with directions to grant the injunctive relief sought. The decree is also reversed to the extent that it provides that any defendant may sell substitutes for natural teeth to the user or prospective user where he employs a licensed dentist who takes the necessary impressions, gives an order or prescription therefor, and makes the fitting thereof in the oral cavity. In all other respects, the decree is affirmed. The cause is remanded, with directions to proceed in conformity with this opinion.

Affirmed in part, and reversed in part and remanded, with directions.

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MAY 1956

LON W. MORREY, D.D.S., EDITOR
VOLUME 52 • NUMBER 5
Published by the American Dental Association
222 East Superior Street • Chicago 11, Illinois

THE Journal OF THE AMERICAN DENTAL ASSOCIATION

Editorials

Progress report on Dental Abstracts

The Association's newest publication, DENTAL ABSTRACTS, which made its bow in January, continues to meet with almost universal approval. Within the first three months the circulation has risen to 9,000, as enthusiastic charter subscribers in 65 countries have told their friends about it.

As a result of helpful suggestions from readers, several improvements have been made in the publication and others are in the making. The classification of articles has been made more logical, the indexing has been improved, and the coverage of material has been further broadened. More than 350 dental and allied publications from 50 countries are scanned monthly for material to be abstracted. The listing of doctoral and masters' dissertations of dental interest in each issue is international in scope, with dental schools all over the world cooperating to make DENTAL ABSTRACTS the world's most authentic source of information on such material.

Five comments that are iterated by readers in country after country are clews to the growing popularity of DENTAL ABSTRACTS:

1. "The abstracts are concise, readable, and a decided boon to those with limited reading time."
2. "Your magazine has unlocked the door to world dental literature."
3. "You have stimulated me to read dental magazines that I had never read before. DENTAL ABSTRACTS makes me realize how rich our dental literature is."
4. "I was very impressed with the extensiveness and scope of the coverage."
5. "For specialists who find it difficult to keep up with the reading in all fields, this is a particularly fine effort because it gives such a nice cross section of the current literature."

The magazine apparently is fulfilling the purpose for which it was launched by the Association. Dentists who have not yet subscribed would be well advised to do so now. A convenient subscription blank is available on page A-20 of this issue.

Physician, heal thyself

The report on the mortality of dentists, 1951-1954, prepared by the Association's Bureau of Economic Research and Statistics,[1] is thought-provoking. Since 1951 the Bureau has been receiving copies of death certificates of dentists from most of the 48 state departments of health. Of 3,707 dentists who died from 1951 through 1954, 1,963, or 54.89 per cent, died of diseases of the circulatory system, chiefly diseases of the heart. The second major cause of death among dentists was neoplasms, accounting for 580 deaths (16.22 per cent). Other ranking causes of death during the four year period were as follows: diseases of the nervous system and sense organs, 10.40 per cent; accidents, poisonings and violence, 5.01 per cent; diseases of the digestive system, 3.66 per cent; diseases of the respiratory system, 2.74 per cent; allergic, endocrine system, metabolic and nutritional diseases (chiefly diabetes mellitus), 1.90 per cent, and infective and parasitic diseases, 1.09 per cent.

There is some comfort to be gained from the fact that the age-adjusted mean age at death for white male dentists was 68.9 years, compared to 66.1 years for the white male population over 24. Dentists on the average live 2.8 years longer than the comparable general population group. Within this over-all picture, however, one or two disturbing shadows intrude.

Circulatory disease, as seen, is the leading cause of death among dentists, as it is among the general population. In 1954 over a third of all deaths in the United States resulted from diseases of the heart.[2] Although heart diseases are generally associated with the older ages, nearly 12 per cent of all deaths among persons 25 to 34 years old resulted from these disorders.

Beginning at age 50, the percentage of dentists dying from circulatory diseases was considerably higher than that of the white male population.

The dentist should take every precaution to protect himself against disease in general and against heart disease in particular. Specifically he should guard against obesity and occupational fatigue, either of which may contribute to circulatory disease.

Obesity among adult Americans is one of this country's most pressing medical problems. Statistics indicate that at least 25,000,000 people are from 10 to 20 per cent overweight and that the death rate from degenerative diseases is significantly greater among the obese than among those of normal weight.[3]

To keep trim and fit, rather than fat and flabby, one must achieve a balance between food intake and physical activity. This can best be accomplished by developing good eating habits, by avoiding freak diets and by indulging in regular, moderate exercise.

Recent research indicates that exercise may be more valuable as a means of reducing than was supposed previously.[3] Experiments show that the overweight person actually burns up more fat for the same amount of exercise than does a person of normal weight. This means that a fat person of sedentary habits has a better chance of losing weight by exercising than had been believed.

The dentist should consider ways by which he can ease the strain of his professional work. Monotonous work motions, frequent muscular tension and difficult work stances may impair the circulation. The dentist, in performing his exacting job and in trying to spare his patient discomfort, may grasp his instruments too tightly, may stand with his shoulders hunched and his back and hips bent even when his work

could be equally effective with his back erect and his muscles relaxed. The Norwegian, Seyffarth, recommends a work chair with a seat high enough for an adequate view of the field of work, with an adequate back rest to provide support at the small of the back, and with adequate foot rests at the base of the patient's chair.[4]

Exercises devised to restore muscle tone are equally important to the dentist's health. Almost all dentists should exercise more than they do. Time spent away from the office is not self-indulgence. It is a favor to the dentist's patients, his family and himself.

It seems paradoxical that dentists, engaged in the preservation of the oral health of the public, often make inadequate efforts to conserve and improve their own physical health. The dentist is like the physician in this respect. It is a puzzle why professional people in the healing arts—those who know the properties of the human body, the diseases which assail it, and the remedies which will benefit it—often slight their teachings and are in less than robust health. One possible explanation is that they obtain a false sense of security through simply knowing so well the secrets of the human body. It is almost as though they held the subconscious belief that their knowledge was a talisman that would protect them from the diseases that ravage their patients. Certainly, many dentists and physicians give less thought and care to their own health than they do to that of their patients.

This is wrong—wrong for the doctor and wrong for society. The demand for dentistry continues to rise but the supply of dentists does not keep pace with the demand. The nation can ill afford to lose any of its dentists through premature death. The social loss is particularly acute when it involves dentists in their fifties, men of experience, knowledge and skill. The dentist owes it to himself, his family and the public to take every reasonable precaution to conserve his health and well-being.

1. American Dental Association, Bureau of Economic Research and Statistics. Mortality of dentists, 1951-1954. J.A.D.A. 52:65 Jan. 1956.
2. Changes in leading causes of death. Progress in Health Services 5:3 March 1956.
3. Rodman, Morton J. Science vs. obesity. R.N. 19:44 March 1956.
4. Noro, Leo. The dentist's occupational health. Suomen hammaslääk.toim. 51:22-29 March 1955.

Public warned against Hoxsey cancer treatment

The action obtained early in April by the federal Food and Drug Administration[1] against the Hoxsey Cancer Clinic is both epochal and fitting; epochal because it marks the beginning of the end of the exploitation of cancer victims by venders of worthless cures; fitting because, in a sense, it served this year to introduce what traditionally has become known as cancer month. On April 4 the United States Department of Health, Education and Welfare advised that the Hoxsey treatment had been found to be worthless by the United States Court of Appeals for the Fifth Circuit, on the basis of evidence presented by the Food and Drug Administration.

In 1953 the FDA obtained a federal court order in Texas prohibiting Hoxsey from shipping his medicine in interstate commerce. The FDA is now preparing a contempt of court action accusing Hoxsey of violating that order. Hoxsey claims to cure cancer "without the use of surgery, x-ray or radium."

The Hoxsey medicines and pills contain potassium iodide, reported the FDA, adding: "There is evidence that potassium iodide accelerates the growth of some cancers." The National Cancer Institute of the United States Public Health Service has reviewed case histories submitted by Hoxsey and advised him that the cases provided no scientific evidence that the Hoxsey treatment had any value in the treatment of internal cancer.

Statisticians estimate that more than forty million persons among our present population eventually will have cancer. Probably the lives of at least a third of them can be saved if existing knowledge is applied to their condition; even more can be saved once the country is cleared of questionable clinics offering impossible cures. Saving the lives of other millions presents the greatest challenge that research has ever faced.

The nation's growing concern over cancer and over the exploitation by those who prey on its sufferers is of vital concern to every dentist.

As a member of the health team the dentist has the obligation to be constantly on the alert for precancerous lesions in the mouth and adjacent tissues.

The dentist has the duty to encourage the public to be aware of cancer and to have some understanding of the rational ways it can be fought.

Finally, the dentist has the obligation to warn his patients and the public against irrational, worthless and harmful methods of cancer treatment.

1. Federal Reporter, Second Series 198:273 and Federal Reporter, Second Series 207:567, 1956.

Washington News Letter

In legislative matters affecting dentistry, the legislative mill on Capitol Hill began grinding at a fast pace in April, and there was every indication that acceleration would continue into May.

House and Senate committees made progress on bills that would broaden social security and include coverage of dentists thereunder; widen health care benefits for servicemen's dependents; make the military medical and dental branches more attractive financially; create a National Library of Medicine, and authorize federal subsidies for teaching and other nonprofit institutions to support construction of medical and dental research.

In addition, the Senate passed a bill which directs the U. S. Public Health Service to conduct a continuing survey of illness and disability in the United States. A bill has been introduced which provides paid-up major medical expense insurance for more than two million federal employees and their dependents.

Both Democrats and Republicans in Congress have shown a favorable disposition toward national health legislation, motivated largely by its conceded political impact in an election year. Save for the impasse that has enveloped bills involving racial segregation, the health legislation record in Congress would be even greater. The troublesome segregation issue is holding up not only the bill on federal aid to public school construction but also measures authorizing grants for physical improvements to dental and medical schools and for extension of the Hill-Burton hospital expansion act, which is due to expire in 1957.

Although the House has passed the social security, military dependents' care and medical-dental career incentive bills, Senate amendment of all three is virtually certain, and final Congressional action is not anticipated before late May or June.

DECLINE IN VA DENTAL CARE

Outpatient dental care of veterans has dropped in volume to less than one fifth of what it was in 1948. Figures for the fiscal year ended June 30, 1955, which were made public by the Veterans Administration in mid-April, depict the sharp decline in outpatient dental services by both VA staff personnel and private practitioners participating in the "home town" care program.

In the 1954-55 fiscal year, fee-basis dentists (numbering some 33,000) completed 112,200 treatment cases. This figure compares with 602,617 in 1948 and with 245,634 in 1953-54. Examinations revealed a comparable decline — 69,082 as against 420,627 in 1948 and 123,170 in 1953-54.

Less abrupt is the reduction in outpatient dental examinations and treatments performed by the VA's full-time personnel. Examinations completed last year totaled 130,694, which compared with 322,732 in the peak year (1950) and 155,476 in 1953-54. Patients treated, numbering 53,013, were only 4,000 under the previous year. Peak year was 1950 in this category also, with 87,088 treatment cases completed.

In the most recent fiscal year, fee-basis cost per patient treated rose 20 per cent —by far the greatest increase since the "home town" care program was instituted in 1948. According to VA figures, it was $119.72, compared with $99.52 in 1953-54. For fee-basis examinations, the cost per patient averaged $15.14, compared with $14.26 in the previous year.

Responsible for the lower outpatient workload was the act of Congress fixing December 31, 1954, as the cutoff date for applications by World War II and Korean veterans having dental disabilities which they considered to be service-connected.

The annual report notes that inpatient dental care is at a high level, with 298,000 patients in veterans' hospitals and domiciliaries having received examinations in 1954-55. Of this number, 156,000 received therapeutic or corrective dentistry during the year.

"The Veterans Administration," says the report, "is currently raising the standards of dental care in VA domiciliaries. During fiscal year 1955, a survey of the dental health of domiciliary members was begun. To date, the results of the survey in nine of the 17 domiciliaries have been tabulated.

"Preliminary results show that 33 per cent of the members examined required dental treatment. Of those domiciled less than one year, 41 per cent were in need of dental treatment; those domiciled one to two years, 27 per cent; two to five years, 33 per cent, and five years or more, 33 per cent. The ratio in the latter categories is considerably higher at certain stations, and seems to vary in relation to the available facilities and staff."

A bill introduced by Sen. George A. Smathers (D. Fla.), would give veteran hospitalization and medical care privileges to civilian dentists and physicians who have served the Army on a contractual basis.

As of the first of April this year, fluoridation of drinking water had been approved for 21 Army posts in the continental United States, Alaska, Hawaii and Puerto Rico.

Leonard A. Scheele, M.D., was sworn in on April 16 for his third four year term as Surgeon General of U. S. Public Health Service; the oath was administered by Marion B. Folsom, Secretary of Health, Education and Welfare.

The Senate Appropriations Committee is expected to report favorably by May 18 a Department of HEW appropriations bill granting a substantial increase in federal grants for dental research.

International Correspondence

NEWS FROM THE REPUBLIC OF ARGENTINA

The Asociacion Odontologica Argentina in a recent meeting elected its board of directors for 1956-1958. The officers are: Antonio Calle Guevara, president; José Manuel Lueje, secretary; Hermenegildo M. Arnejo, treasurer; Ricardo B. Carnevale, Juan Carlos Zugasti, and Samuel Leyte, voting members of the board. Also elected were an honorary board and a financial commission.

Remodeling of the Argentine Dental Association building is near completion. Within a short time it will be in use and will provide many new conveniences for members.

Teaching bodies of all the universities are being reorganized in accordance with democratic principles, a reorganization which should add much to the freedom of teaching. Universities here are nationalized, that is to say, they are not organized as private institutions as in the United States. In the new statute for the universities, the possibility of establishing new universities and colleges privately endowed is provided for. At the present time, the advisability of having private schools is being widely discussed.

All colleges and schools of dentistry are also standardizing their courses and administration. Ricardo Crespi has been reappointed to the Chair of Clinical Prosthesis in the Facultad de Odontología de Buenos Aires.

Ricardo Augusto Crespi,
correspondent from Buenos Aires

NEWS FROM GREAT BRITAIN

W. Stewart Ross writes that one of the results of the National Health Service and the shortage of dental personnel is that the value of the goodwill of dental practices in Great Britain has declined considerably. In many cases practitioners have found it impossible to sell their practices because newly qualified dental surgeons have little difficulty in starting their own practice and are able to build up a sizable clientele in a short space of time. There is, therefore, little incentive for them to pay large sums for the purchase of an established practice.

Although dentists working under the National Health Scheme are entitled to a pension on retirement, commensurate with their turnover, the present decline in "goodwill" is particularly unfair to the older man who, prior to the National Health Scheme, had built up over the years a large private practice. As he can only work a comparatively short time under the "scheme" because of his advanced age, his pension will be small, and the goodwill of his long established practice will provide little additional income.

Recent figures produced by the British Dental Association show another disconcerting feature of national health practice. The earning power of a dentist appears to reach its maximum at the age of 35 and then declines rapidly until by the age of 55 he earns only half the original figure. This anomaly, in which clinical experience and skill appear to have little relationship to earnings, is presumably the result of the conditions under which a dentist works under the National Health Scheme.

When each piece of clinical work is itemized at a set fee, it is apparent that the young vigorous dentist, however inexperienced, can earn a higher income than the older man because he is able to work faster and for longer hours. The old practitioner is not allowed to charge higher fees for his long experience, and as he is unable to work as hard as when he was young, his income declines.

This state of affairs is one of the results of nationalized dental practice and one which is so different from that which obtains in most other professions.

DENTAL HEALTH EDUCATION

Edward Samson, a regular and widely read contributor to the *British Dental Journal*, writes in the February 21 issue on dental health education in an article entitled "Further Outlook Unsettled."

In questioning the effectiveness of dental health education, he states, "It is time for us to reassess our own approach to public enlightenment. . . . We have been unable to create that pride in healthy teeth which is the prerequisite to their receiving professional care."

Dr. Samson urges that the Ministry of

Health and the Ministry of Education cooperate in putting health education to a test. He proposes the choosing of a specific area of the country and subjecting it to intensive propaganda for perhaps two years using the best materials available. School teachers and school dentists would cooperate in teaching dental health and in keeping records to ascertain whether the demand for treatment increases, whether it follows the program of propaganda, if the response is permanent or temporary. In this fashion, the effectiveness of the dental health education program could be ascertained.

ARMED FORCES DENTAL SERVICE

The Ministry of Defense has published the first report of the Forces Medical and Dental Services Committee under the chairmanship of Viscount Waverly.

This committee was set up to review the arrangements for providing medical and dental services for the Armed Forces at home and abroad in peace and war and to make recommendations.

The sections dealing with dental officers, pages 42-50, make interesting reading. Chief among the recommendations are that the dental branches not be amalgamated, that treatment of servicemen by civilian dentists under the National Health Service as a substitute for treatment by dental officers of the Forces is not acceptable and that it is unnecessary to make any change in the status of the three directors of Dental Services. The professional standing of dental officers should be raised and the scope of professional work available to them increased. Refresher courses for dental officers would be beneficial.

Dental officers should have the same consideration as medical officers in regard to arrangements for postings, allocation of married quarters, educational grants and availability of grammar school appointments.

The pay of dental officers should be the same, rank for rank, as that of medical officers. There should be improvements in the emoluments of dental officers in respect to (1) marriage allowances and local overseas allowances for national service officers, (2) gratuity and superannuation fund contributions for short service officers, (3) permanent commission grants for regular officers and (4) specialist pay.

ITEMS OF INTEREST

Plans are now almost complete for this year's annual meeting of the American Dental Society of Europe. The meeting will take place at the Royal College of Surgeons, London, in July. The program includes Carl O. Boucher, Columbus, Ohio, on full dentures; Thomas J. Hill, Cleveland, on recent advances in dental research in America; Campbell Hudson, New York, on restorative dentistry; John Lee, London, on immediate dentures; Leo M. Shanley, St. Louis, on orthodontics for the general practitioner; Oscar E. Stahelin, Switzerland, on removable bridgework with shoulder pin attachments; Peter K. Thomas, Los Angeles, on operative dentistry; Jens Waerhaug, Oslo, on tissue reactions to materials used in operative dentistry; L. M. Wiesstien, Cleveland, on periodontics.

A varied program of table clinics has been planned also. An attractive program of social events has been arranged for members, their ladies and guests. Further information about this meeting can be obtained from the Hon. Secretary, Mr. J. Molony, 110 Harley St., London W. 1.

A most successful meeting was held by the Dental Society of Periodontology in Edinburgh March 3, at which 29 members and guests were present. A paper on masticatory efficiency and periodontal disease was given by Mr. J. W. Galloway of the School of Dental Surgery of the University of Edinburgh.

The Dental Implant Society of Great Britain held a meeting March 27 when a symposium took place dealing with implants used in orthopedic surgery by Dr. John Scales, the behavior of implant materials in the human body by Dr. J. Zarek and dental implants by Mr. Alan Mack.

The new Dentists' Bill received Royal Assent March 15 and thus the dental profession in Great Britain is now completely autonomous. Many changes will take place, chief of which will be the closing of the Dental Board of the United Kingdom in favor of the New General Dental Council, which may prove rather an unwieldy body of 43 members, who will in all probability have their first meeting early in July.

The annual clinical meeting of the American Dental Society of London was held March 28 at the Royal Dental Hospital, London. As usual, this meeting was characterized by the high standard of clinical and table demonstrations which represented the latest teaching in clinical practice.

At the dinner, the guest speaker was Mr. Randolph Churchill, who spoke on Anglo-American relations. In attendance were many of our colleagues who at present are serving in the dental branch of the United States Air Force in Britain.

G. H. Leatherman.
D.M.D., F.D.S., R.C.S., F.A.C.D.

TRUSTEES COMMEND SENATOR HILL FOR RESEARCH STAND; CHOOSE LOS ANGELES FOR 1960 ANNUAL SESSION

The Board of Trustees of the American Dental Association met in Chicago April 2 and 3 to review the work of the Association and to outline program for the coming months. The Association has continued its growth, and its activities continue to expand, it was reported. Membership last year reached a new high of 84,851 as compared to 82,496 for the year previous. The 1955-56 Relief Fund exceeded its quota to make a new record. Demands for dental health education materials and other publications prepared by the Association increased and the campaign of the Association for federal aid to dental research is bearing fruit.

DENTAL RESEARCH

Senator Lister Hill (D., Ala.) was praised by the Trustees for his "exceptional devotion to the cause of better dental health for the American people." In a resolution passed unanimously, the 13-member Board commended the Senator for his support of a bill authorizing 5 million dollars for construction of a building for the National Institute of Dental Research at Bethesda, Md. Senator Hill is chairman of the Senate Labor and Public Welfare Committee which held hearings on the measure and was instrumental in piloting it successfully through the Senate. The Senate on March 29 unanimously approved the bill and sent it to the House for action.

The resolution also commended the Senator for his "clearly expressed determination to expand federal support of dental research carried on in the 43 dental schools."

In a second action, the Board declared itself in favor of a bill now before Congress to create a National Library of Medicine. The bill, S. 3430, would transfer to a permanent civilian agency the present inadequately housed collection of the Armed Forces Medical Library. The new library's board of trustees would include a dental member. The resolution approving in principle the national medical library will be transmitted to the House of Delegates in October.

ANNUAL SESSIONS

The Board of Trustees chose Los Angeles as the site of the 1960 annual session. With the selection of the 1960 convention city, sites for annual sessions are confirmed for the next five years. This year's session will be held in Atlantic City, N. J., October 1-4; the 1957 session in Miami, Fla., November 4-7; the 1958 session in Dallas, Texas, November 10-13, and the 1959 centennial celebration in New York, September 21-24.

Local Arrangements Committee • On recommendation of the General Committee on Local Arrangements, of which Eugene Westcott, Sr., is chairman, the Board approved the following nominations for officers and committee members for the 97th annual session this fall:

Vice-chairmen • Stephen M. Lyons; Benjamin Rosenwasser.

Treasurer • Theodore R. Champlin.

Honorary Chairmen • Daniel F. Lynch, Edward R. White.

Committee on Information • Benjamin Brown, chairman; Jerome B. Goldman, vice-chairman; John G. Campi, Nicholas H. Formica, Martin B. Friedman, Samuel Gardner, Samuel M. Hoffman, Nathaniel Levy, John McQuade, Michael Frost.

Committee on Publicity • Philip A. Baratta, chairman; Thomas F. Powers, vice-chairman; Louis A. Saporito, Dominic J. Galdieri, Lewis

Remodeling and construction of the Association's Central Office is scheduled for completion in early summer, the Board of Trustees was told at its spring meeting. In March, work on both the inside and outside of the building was progressing according to schedule.

M. Katz, Joseph Kershenblatt, William J. Palanky, Harry Saul, J. Ward Weaver, Jr., Henry F. Wisniewski.

Committee on Reception • William A. Giblin, chairman; Charles P. Crowe, vice-chairman; C. Kermit Botkin, Elson C. Burroughs, George M. Blackman, Edward O. Doughty, Theodore A. Gallus, Frank Horner, Sylvanus F. Reese.

Committee on Entertainment & Social Events • Pierce A. Quirk, chairman; Charles S. Jonas, vice-chairman; Theodore S. Gray, Luther A. Heydon, Maxwell J. Lentz, Jac P. Gindin, Milton A. Levy, J. Ward Weaver, Sr., Eugene R. Westcott, Jr., George J. White.

Committee on Clinics & Motion Pictures • William A. Themann, chairman; Herbert N. D. Cahan, vice-chairman; Wilmer A. Abbott, Sr., Wilmer A. Abbott, Jr., John W. Conover, III, Milton B. Asbell, Richard L. Bardsley, Carl E. Housekeeper, Charles P. Hadtke, Eugene W. Newman, Theodore A. Doremus, Harry A. Mann, Albin W. Rauch, Joseph Herbstman, D. Vincent Varallo, Edward B. Zlonczewski.

Committee on Women's Entertainment • Mrs. Eugene R. Westcott, Sr., chairman; Mrs. Philip A. Baratta, Mrs. Charles S. Jonas, vice-chairmen; Mrs. John G. Carr, Mrs. Herbert N. D. Cahan, Mrs. Stephen Lyons, Mrs. Ralph J. Nigro, Mrs. J. Ward Weaver, Sr., Mrs. J. Ward Weaver, Jr., Mrs. Edward R. White.

In addition, the Board approved plans to have the world-famed Philadelphia Orchestra, with Eugene Ormandy conducting, perform a concert at the General Meeting Tuesday evening, October 2.

P. Earle Williams of Dallas, Texas, was chosen General Chairman of the Committee on Local Arrangements for the 1957 annual session. Dr. Williams has been active in the Dallas County Dental Society, which nominated him for the post in conjunction with the Texas Dental Association. He is active also in the American Society of Oral Surgeons.

In a further action, the Trustees voted to award certificates of recognition to members of the Local Arrangements Committees retroactive to 1955.

SECTION OFFICERS FOR 1957

Additional appointments made by the Board were the section officers for 1957. Chosen to head the sections were:

Anesthesiology • Adrian O. Hubbell of California, chairman; P. Earle Williams of Texas, vice-chairman.

Operative Dentistry • Herbert D. Coy of Virginia, chairman; Roger E. Sturdevant of North Carolina, vice-chairman.

Oral Surgery • Karl H. Wood of the District of Columbia, chairman; Don H. Bellinger of Michigan, vice-chairman.

Orthodontics and Oral Development • Clifford L. Whitman of New Jersey, chairman; William R. Humphrey of Colorado, vice-chairman.

Pedodontics • William W. DeMeritt of North Carolina, chairman; Francis W. Summers of California, vice-chairman.

Periodontics • Evert A. Archer of Illinois, chairman; Erwin M. Schaffer of California, vice-chairman.

Practice Administration • Harry M. Klenda of Kansas, chairman; Jay H. Eshleman of Pennsylvania, vice-chairman.

Complete Prosthodontics • Vincent Trapozzano of Florida, chairman; S. Howard Payne of New York, vice-chairman.

Partial Prosthodontics • Douglas H. Yock of Minnesota, chairman; Leroy E. Knowles of California, vice-chairman.

Public Health Dentistry • Rulon W. Openshaw of California, chairman; David F. Striffler of New Mexico, vice-chairman.

Research • Alton K. Fisher of Iowa, chairman; David B. Scott of Maryland, vice-chairman.

Roentgenology • Donald T. Waggener of Nebraska, chairman; Arthur W. Wuehrmann of Alabama, vice-chairman.

Appointed to head the new section on anesthesiology for the current year were Harold W. Krogh of the District of Columbia, chairman, and Adrian O. Hubbell of California, vice-chairman.

COUNCIL ON SCIENTIFIC SESSION

The Board approved the employment of a full-time secretary for the Council on Scientific Session. Mr. Peter C. Goulding, of the Central Office staff has been appointed to the position.

JOURNAL EXPANSION

In the area of its publications program, the Board decided to enlarge the size of THE JOURNAL beginning with the January 1957 issue. An additional 32 pages will be added each month to make possible the publication of more scientific material. THE JOURNAL will then contain a minimum of 224 pages. Expansion is planned also for the quarterly JOURNAL OF ORAL SURGERY. Beginning in January 1958, the magazine will appear bimonthly.

INSURANCE

The Council on Insurance will review the Association's Group Life Insurance Program at no longer than two year intervals with a view toward further improvements in the program, the Trustees decided. The Special Committee on Insurance, having completed its study of the Association's life insurance program, was discharged by the Board.

In its final report, the Special Committee noted that the recent improvements in the insurance program will add about $65,000 in benefits annually to insured members without increases in premiums. "The Group Life Insurance Program has been improved to the point where no similar group offers comparable benefits," the report stated.

DENTAL HEALTH WEEK

The Board directed the Bureau of Public Information to continue its survey of the wishes of constituent and component societies concerning the dates of Children's Dental Health Week. A number of societies have not replied to the Bureau's questionnaire.

LABORATORY RELATIONS

Relations between the dental profession, dental laboratories and technicians were the subject of action by the Board. The Trustees stated their disapproval of the proposed certification of dental laboratories and technicians by the National Association of Dental Laboratories on the ground that "the dental profession cannot yield its right to establish standards for the training of all its auxiliaries."

"The establishment of any program for the certification of dental laboratories and dental laboratory technicians by any agency except the official agencies of this Association" shall be opposed, the Board stated.

Also considered by the Board were the Trade Practice Rules for the Commercial Dental Laboratory Industry issued recently by the Federal Trade Commission. Four dental societies, Massachusetts, New Jersey, Connecticut and The Dental Society of the State of New York, had requested the Trustees to take immediate action to revoke or enjoin the FTC Code.

The Board directed the Council on Dental Trade and Laboratory Relations to "use every resource" to amend the code to meet the policies of the House of Delegates.

In the event that satisfactory changes are not obtained by the time of the annual session, the Council is to prepare recommendations for the House of Delegates on revocation of the code. Additional funds were voted to the Council for this purpose. Meanwhile, the Association will not cooperate in any enforcement of the Code.

In a further action, the Board voted $5,000 for legal and investigative expenses "related to facilitating the enforcement of the federal Mail Order Denture Act." The money may be used cooperatively with the Chicago Dental Society and the Illinois State Dental Society when enforcement activities are "clearly related" to the Mail Order Denture Act and when the Chicago and Illinois societies share equally in the expenses.

The Illinois Supreme Court recently issued a favorable decision in the Chicago Dental Society's suit against advertising laboratories. The laboratories have petitioned the Court for a rehearing.

OTHER ACTIONS

In other actions, the Board voted to accept the invitation of the Japan Dental Association to assist in arranging the scientific program for its 1957 meeting, agreed that the *Rules for Revised Specifications of Dental Materials* should become effective after the rules are agreed on by the Council on Dental Research and without prior approval from the Board, and recommended that recognition of a national ladies' auxiliary be postponed until more experience with auxiliaries is gained on the local level.

The Trustees also noted the setting up of a dental scholarship fund by Semon Eisenberg, to be administered by the Georgia State Dental Association, commended Dr. Eisenberg, and expressed "the hope that other state societies will be stimulated to organize similar programs."

In commenting on reports of Association councils, the Board reaffirmed the stand of the Council on Dental Therapeutics on the so-called therapeutic dentifrices. Scientific proof should be further evaluated, the Board said. "Blanket claims in dentifrice advertising [should] be looked on with disfavor at the present time."

The Board meets again August 9-11 in the Central Office and will hold its fourth meeting September 26 to October 3 in Atlantic City, just prior to the annual session.

Officers attending the spring meeting were: Bernerd C. Kingsbury, president; Harry Lyons, president-elect; Francis J. Herz, first vice-president; Magnus C. Hansen, second vice-president; Marvin E. Kennebeck, third vice-president; Gerald D. Timmons, speaker; Harold Hillenbrand, secretary; C. Willard Camalier, assistant secretary; Louis M. Cruttenden, assistant secretary; H. B. Washburn, treasurer, and Lon W. Morrey, editor.

Trustees attending were: Arthur W. Easton, First District; Earl G. Jones, Seventh District; A. F. Schopper, Sixth District; Lewis W. Thom, Tenth District; John R. Abel, Thirteenth District; William R. Alstadt, Twelfth District; Percy T. Phillips, Second District; Clarence S. Renouard, Eleventh District; Howard B. Higgins, Fifth District; Paul W. Clopper (attending for L. H. Jacob), Eighth District; Paul H. Jeserich, Ninth District; Charles H. Patton, Third District, and Edward R. White, Fourth District.

RELIEF FUND SHATTERS PAST RECORD IN RECORD TIME

The 1955-56 Relief Fund campaign, with two and a half months left to go, shattered all previous records and topped last year's campaign total by nearly $1,500 in mid-April. As of April 16, contributions reached $112,758.08. Last year's July 1 total was $111,273.

As of April 12, the last date for which a breakdown of contributions was available, 42 constituent societies and the U.S. Public Health Service had topped their quotas. Alaska was the individual leader with 748 per cent of quota paid in. Tennessee, with 369 per cent paid, ran second. The smaller societies led in percentage contributions with 120.9 per cent contributed; the larger societies paid in 110.3 per cent.

URGE FUNDS FOR BUILDING RESEARCH FACILITIES

"A vigorous attack upon the dental disease problem depends primarily upon research resources within this nation's dental schools," a committee of the House of Representatives was told in mid-April. On April 13, Shailer Peterson, secretary of the Association's Council on Dental Education, appeared before a subcommittee of the House Committee on Interstate and Foreign Commerce which was holding hearings on S. 849, a bill passed by the Senate last year to provide funds for the construction of health research facilities.

The bill would establish a three year, $90,000,000 program of grants-in-aid on a matching basis to nonfederal institutions such as dental and medical schools to defray the cost of constructing and equipping research facilities.

Dr. Peterson outlined for the Congressmen the toll taken by dental disease, a toll which can be reduced, he said, only through research.

He reported to the Congressmen that a recently completed survey of the dental schools showed that the schools have spent from their own resources over 40 million dollars during the last five years on building, remodeling and equipment.

"The dental schools could conservatively use, during the next three years, at least 75 million dollars for construction and expansion, 18 million of which is needed for construction, expansion and equipment of their research facilities," he said.

HEW Research Budget • Earlier, Association representatives appeared before a Senate committee on another aspect of the research program. Harry Lyons, Association president-elect, and H. Trendley Dean, secretary of the Council on Research, told a Senate Appropriations subcommittee that some 380 new research projects could be started immediately by dental schools and research centers if funds were available.

They urged the Senators to increase to $3,855,000 the research grant funds for the National Institute of Dental Research. The appropriation for the NIDR budget is contained in the HEW budget for fiscal 1957 which begins July 1 of this year.

The increase asked for by the Association "can be readily justified in terms of human health and in the productive expenditure of funds," Dr. Lyons said.

Two weeks previously, after Association testimony, the House voted a $500,000 increase in the original budget proposal, a move which the Association termed a step in the right direction but an amount short of that which could be put to use productively.

Dr. Lyons described for the Senators some of the research projects which would be undertaken if funds were available. The 380 projects were listed in the preliminary report of a survey conducted jointly by the Association's research and dental education councils.

NIDR Building • On March 29, also after Association testimony, the Senate

unanimously passed and sent to the House S. 3246, a bill to authorize 5 million dollars for construction of a building for the National Institute of Dental Research. The amount is 3 million dollars more than a previously approved authorization. The measure was cosponsored by ten Senators. On April 17, Dr. Lyons and J. Roy Doty, secretary of the Council on Dental Therapeutics, appeared before a subcommittee of the House Committee on Interstate and Foreign Commerce to urge passage of the measure by the House.

ASSOCIATION TESTIFIES ON MILITARY MEDICINE BILLS

A number of important changes in a bill providing medical care to dependents of servicemen have been proposed by the American Dental Association. Presenting organized dentistry's viewpoint to the Senate Committee on Armed Services April 13 was Ralph E. Creig, a member of the Council on Legislation.

The bill, passed by the House in March, provides for a government paid medical insurance plan with a commercial or nonprofit carrier such as Blue Cross and Blue Shield acting as fiscal agent. Medical, but not dental care, would be covered by the insurance scheme. Dental care, provided in military facilities, is limited to emergency treatment and to treatment which is a necessary adjunct to medical care. Overseas and in remote areas in the United States a fuller measure of care is authorized.

Dr. Creig made four proposals to the Senators. He urged a strict definition of the dental care to be provided dependents by military dentists. He proposed also that dependents who go overseas be required "to bring their dental health care to a state of maintenance before departing."

These restrictions are necessary, Dr. Creig stated, so that the Armed Forces can carry out a basic objective of their dental program "which is to have the military dental staffs concentrate on their primary mission, the dental health care of military personnel."

He reminded the committee that the continuation of the special physician-dentist draft law had been justified by the Department of Defense on the basis of the dental health needs of servicemen. The Association believes, therefore, Dr. Creig stated, that the bill "ought to be administered in a manner which will not jeopardize the dental health care program provided military personnel."

Dr. Creig also proposed that the Secretary of Defense be authorized to contract for dental care of military dependents "with acceptable local dental sources where overseas dental facilities are not available" in the same manner as he is authorized to contract for medical care.

The Association representative's final suggestion was to include a provision allowing the Secretary of Defense to contract for dental health care of dependents in civilian facilities through group prepayment plans. The bill requires such a program for medical care, but makes no provision for a dental program.

Pilot dental health care prepayment plans are proving successful and may be perfected "in the not too distant future," Dr. Creig said. "We think the Secretary should not be precluded from considering such programs."

Career Incentives • In the same week that Dr. Creig testified on the military dependents' care bill, C. Willard Camalier, Association assistant secretary, testified on H.R. 9428, the military career incentives bill. He told the Senate Armed Services Committee that the Association supported the bill, and he suggested additional proposals to strengthen it.

The career incentives bill tries to make careers in military medicine more attractive by providing, in addition to the present $100 a month special pay, increases of $50 each, at the end of three, six and ten years of service. In addition, time spent in medical and dental school

and in medical, but not dental, internship counts as military service for purposes of rank and promotion.

Dr. Camalier urged inclusion of time spent in dental internships in determining initial rank and promotion rights. Additionally, he proposed that the incentive payments begin after two rather than after three years of service, at the time when dental officers would be completing their draft duty and might be induced to consider a military career.

He reminded the Senators that "fewer than one-fourth of the 5,800 dental officers now in the service are regular officers."

"It is generally admitted," Dr. Camalier said, "that a dental corps staffed primarily with career officers would be more efficient, better trained to its military and ancillary missions, as well as less costly to maintain."

Later, the Senate approved the proposal that special pay begin after two years but failed to give recognition to time spent in dental internship.

ASSOCIATION FAVORS NATIONAL MEDICAL LIBRARY

The establishment of a national library for the health sciences was supported by the American Dental Association in a statement filed with the subcommittee on health of the Senate Committee on Labor and Public Welfare April 11. The action followed endorsement of the plan by the Association's Board of Trustees at its April meeting. The statement was signed by Floyd W. Pillars, a member of the Council on Legislation.

Three bills to establish such a library have been introduced in the Senate. It would be under the direction of a civilian agency, and the present inadequately housed collection of the Armed Forces Medical Library would be transferred to it.

In the statement filed with the committee, Dr. Pillars proposed that the library be named the "National Library of the Health Sciences" rather than the "National Library of Medicine" as is proposed in the bills. He suggested also that it be administered by the National Science Foundation or by the U.S. Public Health Service. Additionally, Dr. Pillars supported the provision for dental representation on the advisory board.

NEW YORK DIRECTOR ADVISES ON TAX STATUS OF INSURANCE

A letter from the Treasury Department concerning the tax-deductibility status of the American Dental Association's health and accident insurance policy has been received by the M.A. Gesner Co., insurance agent for the Association's policy. Donald R. Moysey, Lower Manhattan (N.Y.) district director of the Internal Revenue Service, advises that income received from the policy may be deducted from gross income and that the policy premiums do not constitute business expenses. The text of the letter follows:

This is in reply to your letter dated February 20, 1956, with enclosures, in which you request advice as to whether, under a group insurance policy certificate of the type enclosed, individual dentists must report as income amounts received under the policy and whether premiums paid are deductible under section 162 of the 1954 Code.

Evidence submitted discloses that a master policy issued by the National Casualty Company, Detroit, Michigan, is held by the Secretary of the American Dental Association and against this policy dentists receive a certificate, as above-mentioned, reciting all of the insuring agreements of the master policy.

An examination of the certificate discloses that it provides accidental death and dismemberment benefits, monthly accident benefits to be paid for a period not to exceed 60 months, and monthly sickness benefits to be paid for a period not to exceed 24 months for loss of time from disability. The certificate provides also that the insurance shall terminate when the insured retires or ceases to be actively engaged in the duties of his profession or occupation.

It is the conclusion of this office that the provisions of Rev. Rul. 55-331, C.B. 1955-1, page 271, are applicable. It is held, therefore,

that amounts received pursuant to the insurance contract are excludable from gross income under section 104(a)(3) of the 1954 Code as amounts received as compensation for personal injuries or sickness; and that premiums paid by an individual for the insurance do not constitute business expenses under section 162 of the 1954 Code.

MAKE THREE APPOINTMENTS TO CENTRAL OFFICE STAFF

Three appointments to the Central Office staff have been announced by Harold Hillenbrand, Association secretary. Mr. Peter C. Goulding has been appointed to the newly created post of secretary to the Council on Scientific Session. Mr. John Rush has been added to the staff as assistant business manager, and John Cedrins, Ph.D., replaces Mrs. Susan Crawford, resigned, as assistant librarian in the Bureau of Library and Indexing Service.

Mr. Goulding comes to the new post of Council secretary from the Bureau of Public Information where he has been employed since 1950. He is the author of several magazine articles including "Bootleg Dentistry," an article on the dangers to the public of illegally operating dental laboratories. The article has received favorable comment in several national circulation magazines and was recently reprinted by the Council on Dental Trade and Laboratory Relations. Mr. Goulding's latest article, "The Case of the Telltale Tooth," appears in the April issue of *Today's Health*. In his new position, Mr. Goulding will administer the program for the Association's annual scientific session.

John Rush

Mr. John Rush, assistant business manager, formerly was personnel manager for the Bankers Life and Casualty Company of Chicago. During World War II, he served as management director for the War Manpower Commission for the region serving Illinois, Indiana and Wisconsin. Later he held a similar position with the Wage Stabilization Board.

Dr. Cedrins, who will assist Donald Washburn, director of the Bureau of Library and Indexing Service, received his Ph.D. from Bonn University in Germany. He majored in philosophy, literature and history and presently is completing work for the Master's degree in library science at the University of Chicago graduate library school.

Peter Goulding

John Cedrins

TELEVISION MANUAL PREPARED FOR DENTAL SOCIETY USE

A television manual designed to help dental societies understand some of the technical aspects of TV programming and production has been prepared by the Bureau of Public Information. The manual explains how to get TV time, the kinds of shows a society might put on, the workings of the TV studio and the preparation necessary for taking part in a telecast.

In addition, the manual describes the spot announcements recently produced by the Association as well as other films and slides suitable for television which may be obtained from the Film Library.

DENTAL HEALTH CONFERENCE SCHEDULED FOR MID-MAY

Widely known representatives of the health professions and the fields of law and finance will speak at the Seventh National Dental Health Conference to be held in Chicago May 14-16. The Conference is sponsored by the American Dental Association's Council on Dental Health.

Among the conference speakers are Albert L. Borish, chairman of the Philadelphia County Dental Society council on dental health; Herbert K. Abrams, M.D., medical director of Union Health Service, Inc., Chicago; Miss Pearl Bierman, medical care consultant, American Public Welfare Association, Chicago, and Norman F. Gerrie, assistant chief dental officer of the U.S. Public Health Service in Washington, D.C.

Also on the roster of speakers are Donald J. Galagan, assistant chief, division of dental public health of the USPHS; John W. Stone, public health dentistry section, Michigan Department of Health, and Mr. Bernard J. Conway, secretary of the Association's Council on Legislation.

Harold Hillenbrand, Association secretary, will keynote the conference. R. F. D. Johnson, Council chairman, will preside. Dental health care programs will be discussed by the conference.

AMERICANS INVITED TO TAKE PART IN JAPANESE MEETING

The Association's Board of Trustees, at its recent session, accepted the invitation of the Japan Dental Association to help develop the scientific program for the April 1957 convention in Tokyo. Members of the Association who are willing to take part in the scientific program at their own expense have been asked to

Prof. Gen. Minoguchi, M.D., (left) of the faculty of medicine, Kyoto University, in Kyoto, Japan, discusses American and Japanese dentistry with Louis M. Cruttenden, Association assistant secretary. Dr. Minoguchi is studying the American dental education system preparatory to the setting up of a dental school at Kyoto University. He will be dean of the school which is expected to open in about two years. The Kyoto dental school will be Japan's eighth.

write to Harold Hillenbrand, Association secretary, at the Central Office, and in writing should state the topic of their proposed essay or clinic, Dr. Hillenbrand stated.

The Japan Dental Association is preparing a special program for the entertainment of the visitors from the United States. Group tours will be arranged to points of interest in the Orient.

Federal

HOUSE COMMITTEE REPORTS ON "ABUSES" IN VA PROGRAM

The Veterans Affairs Committee of the House of Representatives in April issued a report on "Abuses of the Veterans Administration Outpatient Program." The report, based on information supplied to the committee by VA offices in 34 states and the District of Columbia, described purported irregularities involving physicians and dentists participating in the "home town" medical and dental care program during the period from January 1, 1953, to March 31, 1955.

In the report on physicians and dentists, Rep. Olin E. Teague (D., Texas), chairman of the House Committee, said "abuses varied from minor administrative failures to serious false claims" but "certainly do not provide the basis for the generalization that there is substantial dishonesty."

The study did not report on the ratio of the "abuses" to the size of the over-all program. In response to press inquiries, Harold Hillenbrand, Association secretary, said that "the alleged abuses were found in a very small percentage of the treatment cases and largely involved a misunderstanding of VA rules and regulations. On the whole, the dental profession has done an outstanding job in providing treatment for millions of veterans under the VA program. The Association has confidence that the government has ample authority to handle any real irregularity."

Dental Societies

ILLINOIS COURT RULES LABS MAY NOT DEAL WITH PUBLIC

The Illinois Supreme Court on March 22 unanimously upheld the constitutionality of an Illinois law prohibiting dental laboratory technicians from dealing directly with the public. The decision was rendered in a suit brought by the Chicago Dental Society against 36 Chicago dental laboratories.

The court's ruling, delivered by Justice Walter Schaefer, upholds a permanent injunction against the laboratories preventing them from performing prosthetic procedures of any type for the public and from using advertisements directed at the public. As a result, future issues of the *Chicago Classified Telephone Directory* will carry no display advertisements for the laboratories. It will include only the laboratories' names, addresses and telephone numbers.

The ruling applies to other forms of advertising as well. The laboratories may not use newspapers, motion picture theaters or window displays. The court's decision climaxed a legal battle started more than five years ago by the dental society.

In its decision, the Illinois Supreme Court pointed out that "voluminous testimony establishes beyond doubt that the furnishing of artificial dentures is intimately related to the general health of the patient, and that the mechanical work of making the denture is but a small part of the total undertaking which always requires biological, physiological and pathological knowledge, and sometimes surgical skill."

The court emphasized that "the evidence establishes that the knowledge and skill of the dentist is necessary in the diagnosis of the case, the taking of impressions, the issuance of instructions to the laboratory and the testing, fitting and adjustment of a prosthetic denture."

The court rejected the defendants' claim that they had a right to sell dentures directly to the public if the impression and the fitting were done by the dentist. The entire procedure which results in the fabrication of the denture is essentially a single process, the court held, and the legislature has the right to insure that "the responsibility to the patient shall not be fragmented."

On the question of advertising, the court ruled that display advertising was a "media calling attention of the public to their business, which is prohibited by law, rather than a business announcement" as the laboratories claimed and which the law allows.

As was expected, the laboratories have applied for a rehearing.

NOTED SPEAKERS HEARD AT ILLINOIS SOCIETIES' MEETING

H. Trendley Dean, secretary of the American Dental Association's Council on Dental Research and internationally known authority on fluoridation, was honored at the recent meeting of the Madison District and St. Clair District (Ill.) Dental Societies. Dr. Dean, a former member of the Madison District society, gave a review of recent dental research. The societies presented him with a silver serving tray.

Also among the speakers were Philip Vierheller of St. Louis and Father Francis J. O'Reilly, S.J., vice-president of St. Louis University and regent of St. Louis University Dental School.

EISENBERG SCHOLARSHIP FUND ESTABLISHED IN GEORGIA

A fund which makes possible the awarding of a $250 scholarship each year to a young person wishing to study dentistry has been established by Semon Eisenberg, a member of the Georgia Dental Association. The fund will be administered by the Association. Dr. Eisenberg has established the fund in memory of his father, who was for many years a member of the dental association. A committee to establish candidate eligibility requirements has been set up. On the committee are: J. M. Hawley of Columbus, J. M. Heard, Jr., of Macon, John E. Buhler and W. Edgar Coleman of Atlanta.

Dental Education

DR. MAIN AND DR. ELLIS NAMED TO A.A.D.S. TOP POSTS

Lee Roy Main, dean of St. Louis University School of Dentistry, was installed as president of the American Association of Dental Schools at the close of its annual meeting March 28 in St. Louis. Chosen president-elect was Roy G. Ellis, dean of the faculty of dentistry at the University of Toronto.

A third dean was selected for the vice-presidency. He was William H. Crawford, dean of the School of Dentistry at the University of Minnesota in Minneapolis.

During the four day meeting, the schools' group adopted resolutions strongly urging Congress to give increased support to dental research, both through grants and through the establishment of a separate building for the National Institute of Dental Research. A special assessment of $375 for each dental school also was voted. The funds will go toward the establishment of an A.A.D.S. central office with a full-time secretary.

DEAN WYLIE HONORED AT TESTIMONIAL DINNER

William L. Wylie, dean of the School of Dentistry of Western Reserve University, was honored at a testimonial dinner March 21 in Cleveland. The dinner was

Among the guests at the recent testimonial dinner for William Leroy Wylie, dean of the School of Dentistry, Western Reserve University, in Cleveland, were (l. to r.): Wendell Wylie, Dean Wylie's son; Mrs. Wylie, the Dean's wife; Dean Wylie; Mrs. R. P. Dressel, wife of Dr. Dressel, the toastmaster; Dr. William C. Stillson, professor of dental anatomy; Dr. John H. Moore, and Mrs. W. C. Stillson.

given by his faculty and associates. The faculty presented the dean with a 21 inch television set and a purse of $600 for a trip to California.

Some 278 persons gathered to honor Dean Wylie. The deans of all of the colleges of Western Reserve University were represented. The University's president, John S. Millis, was a featured speaker. Also among the guests were Dean Postle of the Dental School of Ohio State University and members of the Ohio State Dental Board. Dean Wylie's son, Dr. Wendell Wylie, assistant dean of the Dental School of the University of Southern California, also attended.

Dean Wylie began his teaching career in dentistry on graduation from Northwestern University Dental School in 1919. From the Northwestern faculty he came to Western Reserve, moving up through various teaching positions to the deanship. He has served as dean for 19 years.

Dr. Wylie has been active in organized dentistry as well. He has been active in the International Association for Dental Research, in the Ohio State Dental Society and in the Cleveland Dental Society.

SCHOOLS ANNOUNCE SCHEDULES OF SUMMER COURSES

California • Courses scheduled by the University of California College of Dentistry in San Francisco include: lectures in practical periodontics, May 18 and 19; clinical periodontics, June 15 and 16, and theory and practice of oral rehabilitation, June 2 and 3.

Indiana • A postgraduate course in oral surgery is offered by the Indiana University School of Dentistry in Indianapolis June 4-8. Staff members will review the field of minor oral surgery during the 35 lecture periods. The program is designed for the general practitioner. June 12-15, the school has scheduled a postgraduate course in partial denture construction. Also designed for the general practitioner, the course includes lectures and laboratory sessions. A course in complete denture construction is offered June 18-21.

Northwestern • An advanced course on cephalometic roentgenology is offered by the graduate department of orthodontics, Northwestern University Dental School, in Chicago June 4-6. The course is designed for the practicing orthodontist.

New York University • A 30 hour workshop in practice management to be given afternoons and evenings June 25-29 has been announced

by the College of Dentistry of New York University in New York City. The workshop affords training through student participation and role playing to show how to handle patients so they will want the dentist's services. It includes education and motivation of the patient and the presentation of services to gain cooperative acceptance.

Also scheduled for June is a participation course in occlusal equilibration. Dates for the course are June 11-15.

St. Louis • The St. Louis University School of Dentistry in St. Louis announces courses in dental economics, endodontics, production management, orthodontics and full denture prosthetics. Dental economics, May 21 and 22, will be taught by M. Jules King and John V. Brown; endodontics, May 28 to June 1, by Victor H. Dietz, Patrick Ferrillo and staff; production management, May 28 to June 1, by Ercell Miller; orthodontics, July 9 through July 22, by Samuel J. Lewis and F. Copeland Shelden; full denture prosthetics, September 10-14, by Lester W. Boyd and staff.

Southern California • A course in minor oral surgery will be presented by the University of Southern California School of Dentistry June 11-15 at the school in Los Angeles. The course will include lectures, clinical instruction and round table discussions. Enrollment is limited to 12.

Western Reserve • The department of periodontology and crown and bridge at Western Reserve University School of Dentistry in Cleveland announce a postgraduate course June 18-20 in principles of occlusion. The course is under the direction of Lewis Fox and consists of lectures, seminars and clinical demonstrations.

Washington • Exodontics and minor oral surgery will be taught June 4-15 at the University of Washington School of Dentistry in Seattle. The daily program consists of lectures, demonstrations and clinical practice. The course is designed for the general practitioner. Fourteen staff members from the medical and dental school will teach.

OFFER TECHNICIANS' COURSE AT OHIO DENTAL SCHOOL

The Ohio State University College of Dentistry announces that it is receiving applications for the curriculum of dental laboratory technology. The two year program in the laboratory phases of prosthodontics leads to a Certificate of Graduate Dental Laboratory Technologist. Further information may be obtained from the chairman of dental laboratory technology, Ohio State University College of Dentistry in Columbus.

DENTAL TECHNICIANS COURSE OFFERED AT INDIANA

Indiana University School of Dentistry announces a course for dental technicians June 28-30. The course deals with laboratory technics in crown and bridge and partial denture construction and is designed for individuals now working in dental laboratories. Information on the program may be obtained from the dean at the school in Indianapolis.

Arthur F. Schopper (left), Sixth District Trustee, presents a check to Roy J. Rinehart, dean of the University of Kansas City School of Dentistry. The donation is for the University's fund raising campaign. Dean Rinehart was recently named "Man of the Year" by the dental school's alumni association.

Research

I.A.D.R. URGES MORE FEDERAL FUNDS FOR DENTAL RESEARCH

The International Association for Dental Research, meeting in St. Louis March 21-24, urged Congress "to increase substantially" its support of dental research activities. In resolutions adopted by the North American Division of the I.A.D.R., the research men stressed that "the effective diagnosis, treatment and prevention of dental diseases is largely dependent on the findings of sound basic and clinical research.

"Although American institutions have made increasing contributions to our knowledge of dental disease through research," the I.A.D.R. said, "they have been handicapped in their efforts by the limited amounts of money available."

New officers of the I.A.D.R. are Joseph F. Volker, dean of the School of Dentistry, University of Alabama, president; Reidar F. Sognnaes, assistant dean of the Harvard School of Dental Medicine, president-elect; Ned B. Williams of the University of Pennsylvania, vice-president; Edward H. Hatton, M.D., professor emeritus of Northwestern University, secretary-treasurer, and Dan Y. Burrill of the University of Louisville, assistant secretary-treasurer. George C. Paffenbarger, director of the American Dental Association research staff at the National Bureau of Standards in Washington, D.C., was named trustee.

TWEED FOUNDATION TO GRANT FUNDS FOR SCIENCE RESEARCH

A sum of $2,000 a year for the next five years has been allocated for research in basic and applied science by the Charles H. Tweed Foundation for Orthodontic Research, according to a recent announcement. Application for funds, with information concerning the projects for which funds would be used, may be mailed to the Foundation's secretary, Ben L. Herzberg, 7200 Exchange Ave., in Chicago.

International

LEONEL ESTRADA HEADS COLOMBIAN SOCIETY

Leonel Estrada was chosen president of the Sociedad Odontológica Antioqueña of Colombia at a recent meeting. Others elected were: Cesáreo Vélez G., vice-president; Gerardo Ríos P. and Abraham Ostrovsky D., voting members; Hernando Santamaría O., treasurer, and Alpidio Jiménez G., secretary.

Hector Sacchi (second from left), professor of operative dentistry at the University of Montevideo, Uruguay, who was a guest worker in the dental research section at the National Bureau of Standards in Washington, D. C., receives a certificate of accomplishment from Dr. Wallace R. Brode, associate director of the Bureau. Looking on are (l. to r.): His Excellency Señor Dr. Jose A. Mora, Uruguayan ambassador, and Dr. Allen V. Astin, Bureau director. Dr. Sacchi conducted research on fused dental porcelain and assisted in making the Bureau's motion picture "A Porcelain Jacket Crown Technique."

INTERNATIONAL DENTAL MEETINGS

French Society of Dentofacial Orthopedics—Spanish Soc. of Orthodontics	May 16-20	Madrid, Spain	Pedro Planas	Claudio Coelli 67, Madrid
Segundas Jornadas, Federación Odontológica Argentina	May 27-30		Maximo P. Lesdema	Catamarca 2467, Santa Fe, Argentina
44th Annual Meeting Fédération Dentaire Internationale	May 27-June 3	Zurich, Switzerland	R. H. Boitel	41 Talstrasse, Zurich
Annual Meeting Canadian Dental Association	June 3-6	Banff, Alberta	D. Gullett	234 St. George St., Toronto, Ont., Can.
European Org. for Research on Fluor. & Den. Caries Control	June 9-11	Marburg an der Lahn	H. J. Schmidt	Obere Weinsteige 5, Stuttgart-Degerloch, Germany
Annual Meeting of British Dental Association	June 25-29	Brighton, Sussex	Secretary, B. D. A.	13 Hill St., Berkeley Sq., London W. 1
Scandinavian Congress	July 4-7	Stockholm	Waldemar Waldvik	Kungsgatan 18, Stockholm
American Dental Society of Europe	July 10-13	London	J. P. Molony	110 Harley St., London W. 1
13th National German Dental Meeting	August 20-26	Munich, Germany	F. H. Witt	Universitätstrasse 73, Cologne-Lindenthal
Deutschen Gesellschaft für Zahn-, Mund-und Kieferheilkunde	August 23-26	Munich	F. H. Witt	
International Dental Exhibition	August 22-26	Munich	Alexander Kegel	Turnerstrasse 20, Heidelberg, Germany
31st Italian Congress of Stomatology	Sept. 24-29	Florence	M. Bergamini	6, Via Sassetti, Florence, Italy
5th Annual Congress International Association of Dental Students	Sept. 5-12	Newcastle on Tyne, U.K.	G. Charlton	Sutherland Dental School, Northumberland Rd., Newcastle on Tyne
Annual Meeting Danish Dental Association and Golden Jubilee of Copenhagen Dental Association	Sept. 27	Copenhagen	F. Orth	Østerbrogade 4, Copenhagen, Denmark
97th Annual Session of American Dental Association	Oct. 1-4	Atlantic City, N. J.	H. Hillenbrand	222 E. Superior St. Chicago 11, Ill.
XIIth International Dental Congress	Sept. 7-14, 1957	Rome	Pio Lalli	Via Boezio 16, Rome, Italy
XV Congrès Français de Stomatologie	Sept. 1957	Paris	Jean Bara	30 Avenue Félix, Faure, Paris XV
American Dental Association Centennial Celebration	Sept. 21-24, 1959	New York	H. Hillenbrand	222 E. Superior St., Chicago 11, Ill.

MEN FROM MANY LANDS TO BE AT CARIES CONFERENCE

Researchers from many countries will take part in the June 9-11 meeting of the European Association for Research on Fluoridation and Caries Control to be held in Marburg/Lahn and Kassel, Germany. Men on the program come from Switzerland, Sweden, Italy, Bulgaria, Czechoslovakia and the United States.

A feature of the meeting will be a round table discussion on dental caries and nutrition. In addition, there will be papers on the topical application of fluoride, fluoride dentifrices, caries research in animals and the structure of enamel.

Information on the meeting may be obtained from the general secretary, H. J. Schmidt, Obere Weinsteige 5, Stuttgart-Degerloch, Germany.

SPEAKERS SELECTED FOR QUEBEC DENTAL MEETING

Six essayists have been selected for the second Provincial Annual Congress of the Quebec Dental Association May 31 through June 2. The Congress will be at the Chateau Frontenac Hotel in Quebec City. Essayists are Jean-Paul Lussier of the Faculty of Dentistry, University of Montreal; Louis B. Amyot of Schenectady, N. Y.; Arthur Gold of Springfield, Mass.; A. W. S. Wood of Toronto; Maj. A. T. Roger of the Royal Canadian Dental Corps, Ottawa, and Gerald L. St. Marie of the Veterans Administration Hospital in West Haven, Conn.

Public Health

FLUORIDATION STARTS MAY 1 FOR CHICAGO'S SOUTH SIDE

Fluoridation of water delivered to Chicago's south side and to 23 suburbs begins May 1. The rest of the city and an additional 28 suburbs will have the health procedure within a few months.

Chicago, the nation's second largest city, with a total population of some 3.6 million people, has 790,000 children under 14 years of age. The 51 suburbs using water from Chicago have another 337,000. The number of births has been increasing each year.

Fluoridation was approved by the City Council in June of 1954.

TWO STATES APPOINT DENTAL DIRECTORS

State dental directors have been appointed recently in Texas and Arkansas. Frank B. Bertram, formerly of the Oklahoma State Department of Health, has assumed the duties of director of dental health in the State of Texas Department of Health. Maurice J. Friedman temporarily replaces the late H. Shirley Dwyer in Arkansas.

Dr. Bertram, the new Texas dental director, has been president of the Oklahoma County Dental Society and the American Association of Public Health Dentists. He received his D.D.S. from Washington University School of Dentistry and his M.P.H. from Harvard School of Public Health.

Dr. Friedman is chairman of the Council on Dental Health of the Arkansas State Dental Association. During the past few years he has directed the Children's Dental Health Week observance in that state. He was graduated from the Dental School, Northwestern University.

LEONARD SCHEELE STARTS THIRD TERM AS USPHS CHIEF

Leonard A. Scheele, M.D., was sworn in April 16 for his third term as Surgeon General of the U.S. Public Health Service. Dr. Scheele, who has been Surgeon General since 1948, is the seventh person to hold the office since it was created in 1870. His entire professional career has been spent in the U. S. Public Health Service.

National Defense

Right: Shafik Sidahmed, (center) colonel in the Egyptian Army Dental Corps, was a recent guest of the U. S. Naval Dental School. He has been studying American teaching methods. With Dr. Sidahmed are (l. to r.): Capt. Merril G. Wheatcroft and Capt. C. W. Schantz.

Left: During ceremonies in Heidelberg, Germany, celebrating the 45th anniversary of the Army Dental Corps, Malin Todoroff checks the teeth of James J. Marshall. Looking on are (l. to r.): Col. Willard L. Nielsen, chief, dental service, Heidelberg hospital; Prof. Reinhold Ritter, director, Heidelberg University dental school; Col. Jackson B. Dismukes, hospital commander, and Maj. Gen. James O. Gillespie, chief, professional services division, Office of the Surgeon General, Washington, D.C.

Left: Honored guests at the recent Ohio State Dental Meeting in Cleveland were Maj. Gen. Oscar P. Snyder, chief of the dental services, U.S. Army, and Maj. Gen. Charles I. Carpenter, chief of chaplains, U.S. Air Force (seated, center and right). At the speakers' table with them were Earl G. Jones (left), Seventh District Trustee, and past president Herbert J. Hoppe (standing).

General

MAY NINE IS HOSPITAL DISASTER DRILL DAY

High light of National Hospital Week, sponsored annually by the American Hospital Association, will be National Hospital Disaster Drill Day May 9. Disaster drills carried on in hospitals throughout the country will provide the opportunity for the hospitals to try out their disaster plans. Dentists and others concerned with community disaster preparedness may be invited to cooperate.

DENTISTS ASKED TO SUPPORT BUDDY POPPY CAMPAIGN

Dentists are asked to support the Buddy Poppy campaign of the Veterans of Foreign Wars. Poppies go on sale during the week of Memorial Day. All funds collected help disabled veterans and their families, according to John L. Smith of the VFW Buddy Poppy department. The poppies are made by disabled veterans still in hospitals. Among the projects paid for by poppy sales is the VFW children's city in Eaton Rapids, Mich., where children of deceased veterans are cared for in individual homes housing not more than six children and the house mother. The city has its own community center, hospital, library and farm.

PUBLIC WARNED AGAINST HOXSEY CANCER TREATMENT

Sufferers from cancer, physicians and all concerned with the care of cancer patients were warned last month that the so-called Hoxsey treatment for internal cancer is worthless and that Hoxsey's cancer pills actually contain an ingredient which may accelerate the growth of some cancers. The warning was issued by the Food and Drug Administration. It published its warning in a document in The Federal Register, the first time the agency had taken precisely such action to warn the public against any medicine or treatment.

The Hoxsey medicine contains potassium iodide, the FDA reported. "There is evidence that potassium iodide accelerates the growth of some cancers," it said. Aside from this, the medicine is worthless in the treatment of cancer. The FDA stated that neither it nor the National Cancer Institute of the U. S. Public Health Service had found any evidence that Hoxsey's treatment had value. The FDA has been battling Hoxsey for more than eight years.

In 1953 it won a federal court order in Texas prohibiting Hoxsey from shipping his medicine in interstate commerce. The FDA is now preparing a contempt of court action accusing him of violating that order. Hoxsey claims to cure cancer "without the use of surgery, x-ray or radium."

OCCLUSION TO BE TOPIC OF PITTSBURGH CONFERENCE

Problems of occlusion will be the topic of the May 2 Ninth Annual Conference on Dental Health to be held in Pittsburgh. The conference is sponsored jointly by the School of Dentistry of the University of Pittsburgh and the Odontological Society of Western Pennsylvania. Among the clinicians are Leroy R. Boling, Ph.D., dean of the school of Dentistry of Washington University in St. Louis; E. J. Forrest of the University of Pittsburgh; Sidney Sorrin of New York University, and Lewis Fox of South Norwalk, Conn.

Book Reviews

ATLAS OF CLINICAL PATHOLOGY OF THE ORAL MUCOUS MEMBRANE

By Balint J. Orban, M.D., D.D.S., and Frank M. Wentz, D.D.S. 135 pages with 214 illustrations, 72 in color. Index. $12.50. St. Louis, C. V. Mosby Co., 1955.

The page size of the *Atlas*, approximately 8 by 11 inches, and the arrangement of the material are such as to favor use both in the office and clinic as well as for later study. The *Atlas* is planned as an adjunct to the formal texts on oral diagnosis, hence is long on tables, diagrams, diagnostic aids and illustrations and relatively brief on discussion.

The coverage of the oral region is adequate and in some portions even generous. Not only are both authors well informed and highly competent in this field, but they have had also extensive collaboration from 40 or more of their colleagues in the preparation and selection of this material.

The senior author is favorably known for his skill in the preparation of histological material for use in making illustrations as well as in the clinical application of color photography. The classifications and chart arrangements are ingenious and helpful. The style is simple, and the text easily comprehended. Both practitioners and students will find this a useful tool in the office and clinic.

E. H. Hatton

THE MANAGEMENT OF ORAL DISEASE

By Joseph L. Bernier, D.D.S. 825 pages with 1,001 illustrations and 5 color plates. Index. $15. St. Louis, C. V. Mosby Co., 1955.

The 22 chapters in this book are carefully written and superbly illustrated. The author probably intended to supply all the needs of students, teachers and practitioners for a comprehensive coverage of oral diseases from the standpoint of the important association between pathology and treatment. The chapters on dental caries and periodontal disturbances, however, are much too short to satisfy such objectives. In the preface the author admits this inadequacy and contends that these two fields have become so highly specialized as to permit no other type of coverage.

About one third of the text is concerned with tumors, cysts and new growths. Closely associated with this portion are chapters on dermatological-like diseases, disturbances of nutrition, the salivary glands, nutrition and the jaw. Such content and treatment are ideally suited to the needs of students at all levels, teachers and practitioners in oral surgery.

Within its limitations it is useful in areas other than oral surgery as a text and reference book in oral pathology. Because of the continuous emphasis on the relationship between symptoms, pathology and treatment, it has considered claim to its title. The coverage of oral diseases aside from caries and periodontal disturbances is wholly adequate.

The publisher has more than cooperated with the author to produce a handsome, highly useful book. Printing, paper, illustrations and binding are of top quality. The illustrations are well chosen, adequately labeled and generous in number. There are long lists of well-chosen references at the end of each chapter.

Edward H. Hatton

HUMAN PHYSIOLOGY

By F. R. Winton, M.D., D.Sc., and L. E. Bayliss, Ph.D. Fourth edition. 616 pages with 236 illustrations. Index. $8. Boston, Little, Brown & Co., 1955.

Winton and Bayliss have done a laudable piece of work in the organization of their book. The material is presented concisely and is unfettered by the useless detail so common in some of the larger present-day physiology texts. In this edition, the two authors have enlisted the aid of some of their contemporary colleagues by inviting them to contribute pertinent material from their special fields.

The greater part of nine chapters has been rewritten since the third edition. Two new chapters have been included; one concerns body fluids and the other, transmission at nerve endings. Many illustrations have been changed, and several new ones have been added to this edition.

The bibliography of this text does not adequately represent the scope of material presented. However, the authors do suggest several reliable alternative reference sources to those readers who desire a more detailed analysis of the various sections.

This book would be an excellent text for dental or medical students as it contains the

information necessary for a sound understanding of human physiology. The dental practitioner with a desire to learn more of the "how" and "why" of body function would find this book a worthwhile addition to his library.

H. T. Perry

TEXTBOOK OF ENDOCRINOLOGY

Edited by Robert H. Williams, M.D. Second edition. 776 pages with 173 illustrations. Index. $13. Philadelphia, W. B. Saunders Co., 1955.

This new edition which discusses our current understanding of hormones is an authoritative presentation of the diagnosis and treatment of endocrinopathies. Following a preliminary discussion of the principles of endocrinology are detailed descriptions of the physiology of each of the endocrines, a discussion of the clinical manifestations of dysfunction, description of the special procedures for establishing diagnosis and the hormone preparations indicated in each disorder.

Since there are many nonendocrine disorders with endocrine symptomatology, the authors evaluate genetic defects, metabolic bone diseases, neuroendocrine disorders and others whose study borders on endocrinology. The chapter on laboratory diagnostic and assay procedures is an indication of the extent to which quantitative endocrinology has been developed for clinical application.

The clarity of style, the authenticity of the material, the effectiveness of illustrations, the up to dateness of its content and the completeness of the references to the current international contributors make this book a gem among the few sources available in this clinical field.

I. Newton Kugelmass

A HISTORY OF THE UNITED STATES ARMY DENTAL SERVICE IN WORLD WAR II

By Col. George F. Jeffcott (DC) USA. 362 pages with illustrations, graphs and tables. Index. $3.25. Washington, D.C., Superintendent of Documents, U.S. Government Printing Office, 1955.

A competent and authenticated presentation of the history of the United States Army Dental Service in World War II has been written, together with a brief summary of the organization of the Dental Corps and Service prior to World War II.

This book shows how certain difficulties caused by war had to be overcome; the Dental Corps had to be changed from an almost dormant peacetime service to an ever-expanding wartime service in World War II.

The author has dealt adequately with the organization, administration, personnel and training of the Dental Service. He has dealt also with medico-dental relations, morale in the service and the ever-changing policies of the Dental Corps.

The material is organized logically, and the points are thoroughly substantiated. Tables, graphs and illustrations are adequate. The typography, binding and paper are good, contributing greatly to readability.

This book is a valuable source of information for the junior dental officers in the Regular Army Dental Corps and Reserves and all dentists who aspire to the Regular Army Service.

William H. Ackermann

ANATOMIE RADIOGRAPHIQUE DU MASSIF FACIAL
(ROENTGENOGRAPHIC ANATOMY OF FACIAL STRUCTURES)

By Maurice Bouchet and Georges Dulac. 188 pages with 102 illustrations. Bibliography. Appendix. 3,600 French francs. Paris, Masson & Cie., 1955.

This work is an elaborated atlas with an extensive coverage on such selected items as: general anatomic definitions; pathogenic incidents in the region of the facial features, pathogenic incidents of the cranial base and of the frontal-nasal plate; and systematic roentgenography.

Almost perfect reproductions of roentgenograms emphasize the points of specific importance and interest. The authors have avoided oversimplification. The anatomic points illustrated are selected with care and present many aspects of the important relations between facial structures and diseases which are found with difficulty in customary atlases.

The drawings are executed with skill; in most instances, a desirable degree of three-dimensional quality has been achieved. The captions are clear, and all structures can be identified easily. The text covers adequately the material illustrated and is concise. The conclusions and definitions are enlightening, and with the aid of the numerous illustrations, can be readily understood by American dentists, regardless of their ability to read French. Type, paper and binding are of highest quality.

Paul H. Glucksman

Current Literature

THE FRACTURED MAXILLARY BLOCK NEEDLE

R. W. Helsham. Oral Surg., Oral Med. & Oral Path. 8:1,125 Nov. 1955.

The usual cause for breakage of the hypodermic needle during a maxillary block injection, the difficulties attendant on its recovery and a method of taking roentgenograms to localize its position are discussed. To recover the needle, good access must be obtained, sufficient to allow the surgeon to see and work simultaneously. Localization of the needle must be as accurate as possible.

A case report is presented of an obese patient, 23 years old, in whom a 42 mm. needle had been broken at the hub while a dentist was making a maxillary block injection. The needle was completely buried in the tissue. An intraoral approach was made. Considerable fat was encountered and removed. With better access and the use of blunt dissection, the needle was located and removed. Antibiotic therapy was used for four days, and healing was uneventful. It was thought that the removal of fat might affect the patient's facial contour, but this did not occur. No facial deformity followed the operation.

Warren R. Schram

SURGICAL PREPARATION OF THE ORAL CAVITY FOR PROSTHETIC RESTORATION

Morris J. Boyer and Harvey S. Salb. J. New Jersey D. Soc. 24:14 Nov. 1955.

The value of a good dental prosthesis depends largely on the foundation on which it is to be constructed. Careful mouth examination is important as is the full mouth roentgenogram. Surgery often is required to produce a more nearly ideal base for prosthetic restoration.

Surgical treatment involves osseous structures and soft tissue structures. Treatment of osseous structures includes alveolectomy and removal of retained roots, retained cysts, granulomas and bony exostoses. Soft tissue conditions which must be treated include hyperplastic tissue, soft tissue enlargement of the tuberosity and benign soft tissue lesions. The position and size of the various muscle attachments often pose a serious problem also, and surgical intervention is required to reduce or remove them.

The implant denture has been used successfully; great strides have been made in perfecting it. However, the implant denture should be utilized only after the more standard and conservative procedures have failed to achieve the desired satisfactory results. Proper diagnosis, patient management, surgical treatment and restorative procedures must be utilized in the construction of dentures that are tolerable, functional and esthetic.

Warren R. Schram

COMPLETE DENTURE IMPRESSION TECHNIQUE

Ira E. Klein. J. Pros. Den. 5:739 Nov. 1955.

Preliminary impressions are made of the oral structures involved in complete denture construction by the use of modeling compound and impression wax as the materials for registering the impressions.

A roentgenographic and clinical examination is made of the patient and a history taken. The oral structures to be covered by the complete dentures are outlined in detail.

Modeling compound is softened and placed in a suitable tray which is placed in the mouth. The impression is removed without being chilled. The borders of the modeling compound are trimmed, and a groove is cut into the impression at the median line to a depth of approximately 1 mm. The surface of the dried impression compound is flamed, tempered in water and inserted in the patient's mouth. The objective of beading or grooving the impression compound is to obtain a deeper seating with as little displacement as impression compound permits. The warm compound can flow towards the groove or out over the peripheral borders, thus reducing the flowing time and distance of flow. To complete the impression, the flanges are knife-trimmed 2 mm. below the outline of the mucobuccal fold. Stick impression compound is added, region by region, and the peripheral outline completed.

The mandibular preliminary impression is treated in the same manner as the maxillary impression with one additional step. The groove in the mandibular impression is cut into the imprint of the mandibular ridge

crest. After completion of the modeling compound impression, the inner surface of the lingual border is shaved to allow for a thickness of impression wax. Impression wax is added to the lingual surface and the impression completed.

Casts are prepared from the impressions, and a double thickness shellac baseplate is adapted to the maxillary cast. A short handle is adapted to the baseplate material.

A clear acrylic resin tray, with a short handle, is processed for making the lower final impression tray.

The final impression trays are checked in the patient's mouth for fit, and a zinc oxide-eugenol impression paste is used for making the final impressions.

Joe P. Lambert

GENERAL ANESTHESIA IN DENTISTRY

Francis M. Grem. Illinois M.J. 109:59 Feb. 1956.

The gravity of some operations performed in dentistry has been underemphasized. The extraction of a molar tooth is not a minor procedure, nor is the anesthetic procedure in such an operation minor. Even short operative procedures requiring relatively short anesthesia time can be associated with the greatest danger. Equal vigilance and care must be given to all patients, irrespective of the apparent simplicity of the procedure.

For each patient who is to receive anesthesia to the stage of surgical anesthesia, the following routine preparatory procedures must be carried out, regardless of the duration and severity of the operative procedure or whether it is to be done in the office or hospital: A history must be taken of the status of the cardiac and pulmonary systems, the presence or absence of liver and kidney disease, endocrine disturbances such as diabetes, hypothyroidism or hyperpituitarism, allergies and diseases of the nervous systems such as epilepsy. The history must include information as to the patient's previous experience with anesthetics, and as to whether alcohol, tobacco or habit-forming drugs are used. A blood count and urinalysis should be obtained, and, when indicated, a chest roentgenogram and an electrocardiogram.

Individual premedication should be administered. All patients should refrain from taking solid or liquid material by mouth for at least eight hours before the operation. The heart and lungs should be examined as part of the preoperative physical examination, and the pulse, blood pressure and respiratory rate checked before and at frequent intervals during the operation.

A good suction machine should always be on hand, as should an ample and varied assortment of oropharyngeal and nasopharyngeal airways.

If a parasympatholytic drug has not been administered before the patient arrives for the operation, atropine or scopolamine should be given intravenously ten minutes before the administration of the barbiturate.

It has become increasingly difficult to secure hospital beds for patients requiring dental care. The hospital must be brought to the patient if the patient cannot be brought to the hospital; that is, hospital facilities must be created in the dental office. Absolute essentials include: a physician anesthesiologist; a competent dentist and assistant; an anesthetic machine of the finest type available; a suction machine; an assortment of oropharyngeal and nasopharyngeal airways; accessories for use in endotracheal anesthesia; drugs; needles, syringes and other materials for the administration of intravenous anesthesia; a blood pressure apparatus; charts and records, and a postanesthesia observation room.

Anesthetic management for various procedures in dentistry is described.

OSTEOMAS OF THE ORAL CAVITY

John C. Versnel. J. Oral. Surg. 14:61 Jan. 1956.

The possible etiology of two osteomas of the jaws is discussed. There was evidence that one of them, a rather large peripheral osteoma, might have had as its source an infected tooth of long standing. The preoperative as well as the postoperative course was uneventful. The surgical removal of the peripheral osteoma was carried out through an intraoral approach.

The second was a central osteoma in the maxilla. Here again the tumor mass arose in the region of, and immediately after, an infection. The operative procedure consisted of surgical enucleation of the tumor mass. The preoperative and postoperative course was uneventful.

Of all the possible etiologies for this type of tumor, the evidence in these instances points to an infection in the region of the osteoma which occurred prior to the patient's becoming aware of the tumor mass.

Deaths

Angonnet, Claude A., San Francisco; College of Dentistry, University of California, 1910; died December 31; aged 63.

Ashbaugh, William D., Washington, Pa.; School of Dentistry, University of Pittsburgh, 1925; died November 12; aged 56.

Barton, Orville M., Long Beach, Calif.; College of Dentistry, University of Michigan, 1895; died December 19; aged 88.

Bean, Irving W., Winfield, Kan.; Chicago College of Dental Surgery, Loyola University, 1901; died November 6; aged 73.

Becker, Arthur F., Lake View, Iowa; College of Dentistry, Drake University, 1905; died October 4; aged 73.

Bedenbaugh, Andrew J., Columbia, S. C.; Baltimore College of Dental Surgery, University of Maryland, 1913; died December 14; aged 67.

Berry, Herbert T., Chicago; Dental School, Northwestern University, 1898; died January 7; aged 79.

Billingham, Oscar W., Jamaica Plain, Mass.; School of Dental Medicine, Tufts University, 1918; died December 18; aged 59.

Blanton, Preston M., Charleston, S. C.; School of Dentistry, Medical College of Virginia, 1916; died December 19; aged 59.

Bolton, George H., Milwaukee; Department of Dental Surgery, Wisconsin College of Physicians and Surgeons, 1904; died December 7; aged 72.

Bottomley, William F., Irvington, N. J.; Philadelphia Dental College, 1903; died November 11; aged 84.

Brady, James A., Philadelphia; Medico-Chirurgical College of Philadelphia, 1912; died December 27; aged 76.

Brandstein, Raymond M., New York; School of Dental and Oral Surgery, Columbia University, 1938; died July 1.

Brewster, Robert N., Portland, Ore.; North Pacific College of Oregon, Portland, 1905; died in December.

Brown, Angus M., Montclair, N. J.; School of Dentistry, University of Pennsylvania, 1934; died January 2.

Burkett, Lyle M., San Diego; College of Dentistry, University of Nebraska, 1933; died December 19; aged 47.

Burlew, Charles R., Yonkers, N. Y.; School of Dentistry, University of Pennsylvania, 1895; died December 6; aged 83.

Carter, Harlan W., Fort Scott, Kan.; Kansas City-Western Dental College, 1930; died December 6; aged 50.

Cates, Frank W., Talihina, Okla.; Kansas City-Western Dental College, 1924; died December 14; aged 56.

Cline, Eldred D., Fort Wayne, Ind.; School of Dentistry, Indiana University, 1927; died November 24; aged 50.

Cofrancesco, Richard E., Oakville, Conn.; Baltimore College of Dental Surgery, 1935; died November 21; aged 46.

Creegan, George H., St. Louis; School of Dentistry, Washington University, St. Louis, 1914; died December 29; aged 72.

Crosby, Frank D., Bridgeport, Conn.; Philadelphia Dental College, 1892; died December 18; aged 87.

Cunningham, William J., Kankakee, Ill.; Chicago College of Dental Surgery, Loyola University, 1934; died December 7; aged 46.

Davis, Charles J., Chicago; Dental Department, Meharry Medical College, 1916; died November 26; aged 65.

Dicksteen, Louis, Binghamton, N. Y.; New York College of Dentistry, 1914; died November 18; aged 66.

Drellich, Samuel B., Flushing, N. Y.; School of Dental and Oral Surgery, Columbia University, 1924; died January 5, 1956; aged 53.

Dressor, Chauncey E., Bethlehem, Pa.; School of Dentistry, University of Pennsylvania, 1906; died December 30; aged 72.

Du Brul, Leonard C., New York; College of Dental and Oral Surgery, New York, 1921; died December 30; aged 56.

Eastman, Harry, Logan, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1900; died December 19; aged 79.

Farkes, David D., Los Angeles; College of Dentistry, Western Reserve University, 1916; died December 2; aged 62.

Farrington, Delbert G., Caldwell, N. J.; Philadelphia Dental College, 1898; died December 6; aged 79.

Fink, Louis I., Canton, Ohio; College of Dentistry, Western Reserve University, 1916; died October 20; aged 62.

Fouser, Thomas E., Rochelle, Ill.; Philadelphia Dental College, 1894; died November 12; aged 88.

French, Lyle V., Benton, Wis.; Chicago College of Dental Surgery, Loyola University, 1919; died November 22; aged 60.

Fruehan, John G., Scranton, Pa.; Philadelphia Dental College, 1901; died in December; aged 77.

Gardner, Forrest Lee, Cornell, Ill.; Dental School, Northwestern University, 1903; died August 1.

Gardner, George W., Royal Oak, Md.; School of Dentistry, University of Buffalo, 1903; died December 10; aged 76.

Geer, Frank D., Jr., Johnstown, Pa.; School of Dentistry, University of Pittsburgh, 1924; died December 19; aged 53.

Gillogly, Harold E., Chicago; Chicago College of Dental Surgery, Loyola University, 1924; died January 9, 1956; aged 55.

Goberman, Abraham, Wilmington, Del.; Dental Department, Baltimore Medical College, 1911; died December 5; aged 70.

Goldschlag, Paul E., Brooklyn; New York College of Dentistry, 1920; died January 1, 1956; aged 55.

Gordon, James R., Kansas City, Kan.; Western Dental College, Kansas City, 1917; died December 29; aged 67.

Gore, Jehu T., Upper Darby, Pa.; School of Dentistry, University of Pennsylvania, 1902; died December 9; aged 76.

Greenberg, Jonas S., New York; New York College of Dentistry, 1905; died December 4; aged 78.

Griffith, John W., Tacoma, Wash.; School of Dentistry, North Pacific College of Oregon, Portland, 1924; died November 30; aged 56.

Gronim, Michael, Woodside, N. Y.; College of Dental and Oral Surgery, New York, 1908; died December 9; aged 73.

Grove, Harry C., Hagerstown, Md.; Baltimore College of Dental Surgery, University of Maryland, 1939; died December 14; aged 39.

Hamilton, Claude B., Columbia Falls, Mont.; Indiana Dental College, 1910; died November 13.

Harris, Eldon E., Austin, Texas; College of Dentistry, Baylor University, 1927; died November 25; aged 50.

Harrison, Everett F., Batesville, Ark.; School of Dentistry, Vanderbilt University, 1916; died December 19; aged 72.

Harty, William F., Gloucester, Mass.; School of Dental Medicine, Tufts University, 1918; died May 18, 1955; aged 61.

Hasbrouck, Arthur S., Batavia, N. Y.; died September 26; aged 83.

Heath, A. Edward, Philadelphia; School of Dentistry, University of Pennsylvania, 1901; died November 30; aged 81.

Hekel, Robert G., Glendale, Calif.; College of Dentistry, University of Iowa, 1926; died December 13; aged 55.

Hendricks, Howard E., San Francisco; College of Dentistry, University of California, 1920; died December 20; aged 74.

Henrichson, William A., Brooklyn; New York College of Dentistry, 1914; died December 2; aged 62.

Hickman, Edward H., Arcola, Ill.; Chicago College of Dental Surgery, Loyola University, 1894; died December 9; aged 82.

Hirth, Oscar J., St. Louis; School of Dentistry, Washington University, St. Louis, 1914; died December 18; aged 61.

Hoadley, Paul L., Yorkville, Ill.; Chicago College of Dental Surgery, Loyola University, 1903; died November 27; aged 80.

Hoffman, Raphael, Brooklyn; New York College of Dentistry, 1924; died January 3, 1956; aged 52.

Howlett, Robert B., Caro, Mich.; College of Dental Surgery, University of Michigan, 1909; died December 14; aged 71.

Hull, A. L., New Albany, Ind.; School of Dentistry, Indiana University, 1902; died July 15; aged 80.

Hutterer, Ray, New York; College of Dental and Oral Surgery, New York, 1921; died November 7; aged 64.

Huyck, Richard J., Decatur, Mich.; College of Dental Surgery, University of Michigan, 1899; died November 7; aged 79.

Ice, James E., Eufaula, Okla.; Cincinnati College of Dental Surgery, 1909; died December 26; aged 78.

Ittel, William H., Conneaut Lake, Pa.; School of Dentistry, University of Pittsburgh, 1925; died December 22; aged 53.

Jensen, James, Milwaukee; Department of Dental Surgery, Wisconsin College of Physicians and Surgeons, 1905; died December 13; aged 77.

Jesserun, Oscar A., West Collingswood, N. J.; School of Dentistry, Temple University, 1939; died November 30; aged 47.

Jewett, Fred T., Bellows Falls, Vt.; School of Dental Medicine, Tufts University, 1917; died December 18; aged 59.

Johnson, James A., Norris City, Ill.; Barnes Dental College, St. Louis, 1914; died December 24; aged 74.

Johnston, John H., Roundup, Mont.; Chicago College of Dental Surgery, Loyola University, 1897; died December 5; aged 78.

Johnston, William F., Champaign, Ill.; Dental School, Northwestern University, 1924; died December 20; aged 55.

Kagy, Joseph R., Chicago; Dental School, Northwestern University, 1905; died December 26; aged 75.

Kaufman, Aaron I., New York; New York College of Dentistry, 1923; died December 28; aged 56.

Kirkpatrick, Joseph W., South Pittsburg, Tenn.; School of Dentistry, Vanderbilt University, 1923; died November 19; aged 57.

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THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION
222 East Superior Street, Chicago 11, Illinois
WHitehall 4-6730

LON W. MORREY, *Editor* JOHN J. HOLLISTER, *Business Manager*

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Announcements

MEETINGS OF THE AMERICAN DENTAL ASSOCIATION

Ninety-Seventh Annual Session	Oct. 1-4, 1956	Atlantic City, N. J.
Ninety-Eighth Annual Session	Nov. 4-7, 1957	Miami, Fla.
Ninety-Ninth Annual Session	Nov. 10-13, 1958	Dallas, Texas
One-Hundredth Annual Session	Sept. 21-24, 1959	New York

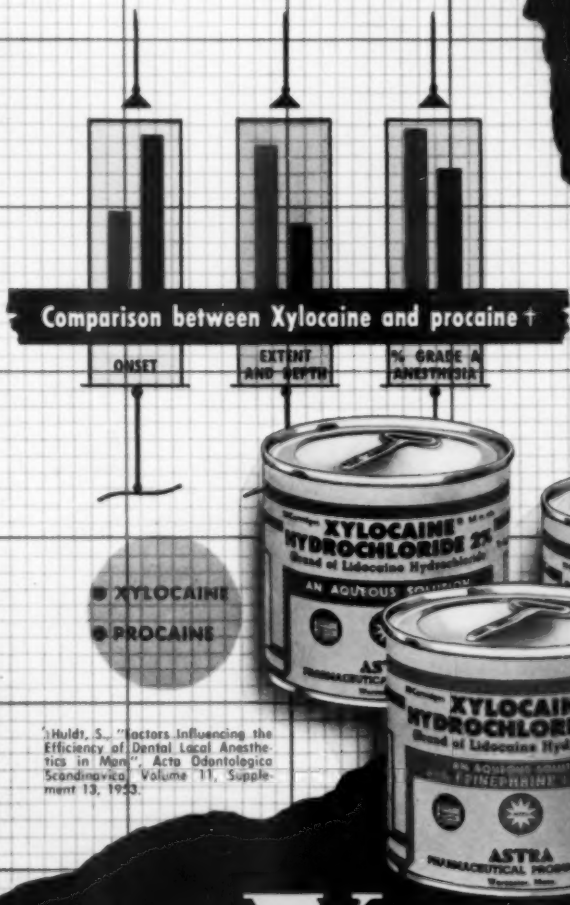
MEETINGS OF CONSTITUENT SOCIETIES

State	Date	Place	Secretary	Address
Alabama			F. A. Finney, Jr.	1045 Forrest Ave., Gadsden
Alaska	Aug. 15-18	Fairbanks	J. L. Irby	1010 Noble St., Fairbanks
Arizona			R. W. Christensen	17 E. Weldon Ave., Phoenix
Arkansas			D. M. Hamm	Box 89, Clarksville
California			W. J. Healy	450 Sutter St., San Francisco
S. California			J. P. Bowers	903 Crenshaw Blvd., Los Angeles 19
Colorado	Oct. 21-24	Colorado Springs	W. R. Humphrey	Republic Bldg., Denver
Connecticut	May 2-4	Hartford	E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware	Jan. 1957		J. C. Gantt	1102 Madison St., Wilmington
District of Columbia	Mar. 10-13, 1957	Washington	J. F. Keaveny	1029 Vermont Ave., N.W., Washington
Florida	May 28-30	Miami Beach	W. A. Buhner	167 Broadway, Daytona Beach
Georgia	Oct. 21-24	Savannah	J. W. Yarbrough	Bibb Bldg., Macon
Hawaii	Sept. 10-15	Maui Island	J. H. Dawe	810 N. Vineyard St., Honolulu
Idaho	Sept. 5-7	Sun Valley	D. E. Sonius	125 Fourth Ave., N., Twin Falls
Illinois	May 14-16	Springfield	P. W. Clopper	Jefferson Bldg., Peoria
Indiana	May 21-23	Indianapolis	D. C. Barnhill	Bankers Trust Bldg., Indianapolis
Iowa	May 6-9	Des Moines	H. I. Wilson	Insurance Exchange Bldg., Des Moines
Kansas	May 14-17	Topeka	F. A. Richmond	Brotherhood Bldg., Kansas City
Kentucky			A. B. Coxwell, Jr.	1976 Douglass Blvd., Louisville
Louisiana			J. S. Bernhard	2515 Line Ave., Shreveport
Maine	June 21-23	Rockland	S. M. Gower	Box 27, Skowhegan
Maryland	May 7-9	Baltimore	C. L. Inman, Jr.	Medical Arts Bldg., Baltimore
Massachusetts	May 6-9	Boston	H. E. Tingley	12 Bay State Rd., Boston
Michigan			F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota			C. V. E. Cassel	Hamm Bldg., St. Paul
Mississippi	June 10-13	Biloxi	B. A. Cohen	Plaza Bldg., Jackson
Missouri	May 6-9	Jefferson City	E. D. Suggett	Merchants Bank Bldg., Jefferson City
Montana	May 3-6	Helena	E. G. Vedova	Box 311, Roundup
Nebraska			F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada	May 7-9	Las Vegas	O. M. Seifert	506 Humboldt St., Reno
New Hampshire	June 24-27	Rye Beach	F. E. Williams	814 Elm St., Manchester
New Jersey			J. G. Carr	407 Cooper St., Camden
New Mexico	May 20-24	Santa Fe	J. S. Ellar	Medical Arts Sq., N.E., Albuquerque
New York	May 14-16	Syracuse	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 13-16	Pinehurst	R. D. Coffey	Box 270, Morganton
North Dakota	May 6-9	Minot	J. H. Pfister	419½ Dakota Ave., Wahpeton
Ohio	Oct. 28-31	Columbus	E. G. Jones	185 E. State St., Columbus
Oklahoma			S. A. Russman	Medical Arts Bldg., Oklahoma City
Oregon			T. D. Holder	Selling Bldg., Portland
Panama Canal Zone			J. J. Dunne	5700 Dispensary, Albrook Air Force Base
Pennsylvania			M. D. Zimmerman	217 State St., Harrisburg
Puerto Rico	Nov. 25		R. Carrasquillo	P.O. Box 214, Rio Piedras

State	Date	Place	Secretary	Address
Rhode Island			J. S. Allen	Union Trust Bldg., Providence
South Carolina	May 6-8	Spartanburg	J. R. Owings	7 Medical Court, Greenville
South Dakota	May 13-16	Huron	R. E. Decker	Parker
Tennessee			A. M. Ballentine	Pulaski
Texas			W. Ogle	3707 Gaston Ave., Dallas
Utah	May 17-19	Salt Lake City	R. C. Dalgleish	State Capitol Bldg., Salt Lake City
Vermont	May 20-22	Manchester	E. H. Van Santvoord	128 Merchants Row, Rutland
Virginia	May 9-12	Roanoke	W. T. McAfee	Colonial National Bank Bldg., Roanoke
Washington			J. M. Deines	227 Broadway, N., Seattle
West Virginia	July 22-25	White Sulphur Springs	G. N. Casto, Jr.	710½ Lee St., Charleston
Wisconsin			A. E. Kopp	Wells Bldg., Milwaukee
Wyoming	June 14-16	Cody	T. J. Drew	State Office Bldg., Cheyenne

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Alabama	June 24-29* June 25, 26†	Birmingham	W. L. McCarty	Professional Center, Montgomery
Alaska	Aug. 7-10* Aug. 7, 8†	Fairbanks	R. H. Williams	Box 2122, Juneau
Arizona	June 18-22* June 20†	Florence	W. G. Biddulph	1502 W. Osborn Rd., Phoenix
Arkansas	June 18-22	Little Rock	W. T. Jones	107 E. Shelton, Monticello
California	June 18 July 23	Los Angeles San Francisco	T. E. Tilden	Medico-Dental Bldg., Sacramento
Colorado	June 25-29	Denver	R. F. Gilmore	Republic Bldg., Denver
Connecticut	June 17-23* June 17-23†	New York Bridgeport	C. G. Brooks	302 State St., New London
Delaware	June 25*† June 26-28*†	Philadelphia Wilmington	P. K. Musselman	143 W. Main St., Newark
District of Columbia	June 4-7, 9	Washington	W. T. Birthright	1835 Eye St., N.W., Washington
Florida	July 9-19*†	Jacksonville	R. P. Taylor, Jr.	P. O. Box 2913, Jacksonville
Georgia			P. M. McNeil	First National Bank Bldg., Rome
Hawaii	Aug. 30-Sept. 3‡		H. L. Houvener	Dillingham Bldg., Honolulu
Idaho	June 25	Boise	A. G. DeWinter	Sun Bldg., Boise
Illinois	June 26-29‡ Nov. 27-30‡		W. A. McKee	Wood Bldg., Benton
Indiana	June 12-15*†	Indianapolis	C. A. Frech	Gary National Bank Bldg., Gary
Iowa	May 28-June 1*†	Iowa City	P. A. Hahn	Farmers & Merchants Bank Bldg., Burlington
Kansas	June 11-14‡		G. L. Teall	Box 71, Hiawatha
Kentucky	June 4-7*†	Louisville	J. J. Kelly	102 W. Madison St., Franklin
Louisiana	June 3-8	New Orleans	R. C. Steib	Maison Blanche Bldg., New Orleans
Maine	June 18-20	Boston	A. S. Appleby	Box 260, Skowhegan
Maryland	June 11-13‡		H. Levin	3429 Park Heights Ave., Baltimore
Massachusetts	June 11, 12* June 14, 15*†	Boston	T. J. Glennon	323 Main St., Woburn
Michigan	June 10-16	Ann Arbor	J. L. Champagne	3714 W. McNichols Rd., Detroit
Minnesota	June 11-15‡		M. G. Walls	615 Montcalm Place, St. Paul
Mississippi	June 19-21‡		J. C. Boswell	Lamar Life Bldg., Jackson
Missouri			R. R. Rhoades	Central Trust Bldg., Jefferson City
Montana			R. O. Betzner	303 Power Block, Helena
Nebraska	June 8-14	Lincoln	H. E. Weber	Federal Securities Bldg., Lincoln
Nevada	June 25	Reno	R. Whitehead	Masonic Temple, Reno
New Hampshire	June 21, 22* June 21†	Boston	S. G. Markos	8 Renaud Ave., Dover
New Jersey	June 25-28 June 29, 30	Philadelphia Trenton	W. A. Wilson	150 E State St., Trenton
New Mexico	June 18-23	Santa Fe	J. J. Clarke, Sr.	Artesia
New York	June 21, 22, 26-29*‡ June 21, 22, 26, 27†‡ Oct. 10, 11, 16-19*‡ Oct. 10, 16, 17†‡		D. W. Beier	23 S. Pearl St., Albany 7



†Huldt, S., "Factors Influencing the Efficiency of Dental Local Anesthetics in Man", Acta Odontologica Scandinavica, Volume 11, Supplement 13, 1953.

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North Carolina	June 25	Chapel Hill	J. H. Gulon	Doctors Bldg., Charlotte 7
North Dakota	July 9-13	Fargo	T. M. Flath	Williston
Ohio	June 14-16, 18-20	Columbus	H. B. Smith	322 E. State St., Columbus
Oklahoma	June 18-20*†	Oklahoma City	W. E. Cole	First National Bldg., Oklahoma City
Oregon	June 4-7*†	Portland	F. L. Utter	Pioneer Trust Bldg., Salem
Pennsylvania	June 18-23*†	Philadelphia Pittsburgh	A. M. Stinson	Dept. of Public Instruction, Box 911, Harrisburg
Puerto Rico			J. Mercado C.	Box 3717, Santurce
Rhode Island			F. M. Hackett	267 Academy Ave., Providence
South Carolina	June 21-23	Columbia	J. L. Gunter	1226 Pickens St., Columbia
South Dakota	June 17-20	Sioux Falls	H. T. Aker	Canton
Tennessee	June 11-15‡		C. R. Aita	Bennie Dillon Bldg., Nashville
Texas	June 10-16*	Houston	R. T. Weber	Capital National Bank Bldg., Austin
	June 14-16†			
Utah			G. W. Vogel	Eccles Bldg., Ogden
Vermont	June 25-27*†	Burlington	P. M. Fitch	Newport
Virginia	June 4-9*	Richmond	J. M. Hughes	Medical Arts Bldg., Richmond
	June 4, 5†			
Washington	June 18-21	Seattle	M. L. Mower	National Bank of Commerce Bldg., Olympia
West Virginia	June 25-27*†	West Liberty	J. B. Davis	Goff Bldg., Clarksburg
Wisconsin	June 4-8*†	Milwaukee	S. F. Donovan	Tomah
Wyoming			W. A. Hocker	O & S Bldg., Casper

Most states require applications to be in 30 days prior to examination date.
*Dental examination. †Dental hygiene examination. ‡Write to secretary of dental examining board for information on locations of examinations. §Approximate dates—verify with state dental examining board.

MEETINGS OF OTHER ORGANIZATIONS

Name	Date	Place	Secy. or Chm.	Address
American Academy of Dental Medicine	June 21-24	Detroit	G. J. Witkin Secy.	45 Broadway, Yonkers, N.Y.
American Academy of Oral Roentgenology	Sept. 28, 29	Atlantic City, N. J.	H. M. Berry, Jr. Secy.	4001 Spruce St., Philadelphia 4
American Academy of Pedodontics	June 11-15	Milwaukee	E. C. Schildwachter Secy.	6831 Seville Ave., Huntington Park, Calif.
American Academy of Periodontology	Sept. 27-29	Atlantic City, N.J.	C. E. Chamberlain Secy.	115 North St., Peoria, Ill.
American Association of Dental Examiners	Sept. 28, 29	Atlantic City, N.J.	C. A. Bumstead Secy.	Stuart Bldg., Lincoln, Neb.
American Board of Dental Public Health	Sept. 27, 28	Atlantic City, N.J.	P. E. Blackerby, Jr. Secy.	250 Champion St., Battle Creek, Mich.
American Dental Society of Europe	July 10-13	London, England	J. P. Molony Hon. Secy.	110 Harley St., London W.1, England
American Denture Society	Sept. 28, 29	Atlantic City, N.J.	V. L. Steffel Secy.	College of Dentistry, Ohio State University, Columbus
American Society of Dentistry for Children	Sept. 28-30	Atlantic City, N.J.	H. C. Hester Pub. Chm.	Arcade Bldg., Glen Ridge, N.J.
American Society of Oral Surgeons	Sept. 25-28	New York	R. F. Whalen Exec. Secy.	M.C.V. Box 876, Richmond, Va.
Association of American Women Dentists	Oct. 1	Atlantic City, N.J.	N. E. McDonald Secy.	151 Engle St., Englewood, N.J.
British Dental Association	June 25-29	Brighton, Sussex, England	H. P. Buchanan Secy.	13 Hill St., Berkeley Sq., London, England
Canadian Dental Association	June 3-6	Banff, Canada	R. L. Rasmussen	Greyhound Bldg., Calgary, Alberta, Canada
Chicago Dental Society	Feb. 3-6, 1957	Chicago	K. S. Richardson Exec. Secy.	30 N. Michigan Ave. Chicago
Council on Dental Education, Dental Aptitude Tests	Oct. 5, 6		S. Peterson Secy.	222 E. Superior St., Chicago
Danish Dental Association	Sept. 27	Copenhagen, Denmark	F. Orth	Østerbrogade 4, Copenhagen, Denmark
Federation Dentaire Internationale	May 28-June 3	Zurich, Switzerland	G. H. Leatherman Secy. Gen.	35 Devonshire Place, London, England
Federacion Odontologica Argentina	May 27-30		M. P. Lesdema	Catamarca 2467, Santa Fe, Argentina

Name	Date	Place	Secy. or Chm.	Address
French Society of Dento-facial Orthopedics—II Meeting of Spanish Society of Orthodontics	May 16-20	Madrid, Spain	P. Planas	Claudio Coelli 67, Madrid, Spain
Maritime Dental Association Convention	June 27-29	Halifax, Nova Scotia, Canada	E. F. Dexter Secy.	5 Dutch Village Rd., Halifax, Nova Scotia, Canada
Medical Library Association	June 18-22	Los Angeles	A. N. Brandon Chm.	College of Medical Evangelists, P. O. Box 278, Loma Linda, Calif.
National Board of Dental Examiners	Dec. 3, 4		G. J. Casey Secy.	222 E. Superior St., Chicago
New England Dental Society	Oct. 24, 25	Boston	F. L. Finley, Jr. Secy.	43 Farmington Ave., Hartford, Conn.
Northeastern Dental Society	June 3-6	Swampscott, Mass.	M. J. Frasca Secy.	153 Cabot St., Beverly, Mass.
Northwest Conference in Dental Medicine, Twelfth Annual Conference	May 13-17	Victoria, B.C., Canada	G. Underwood Secy.	Selling Bldg., Portland, Ore.
Quebec Dental Association	May 31-June 2	Quebec City, Canada	P. Jean Secy.	1294 Maguire Sillery, Quebec 6, P.Q., Canada
Scandinavian Congress	July 4-7	Stockholm, Sweden	W. Waldvik	Kunggatan 18, Stockholm, Sweden
Seventh Annual Berkshire Conference	June 17-21	Lenox, Mass.	I. Glickman Dir.	Tufts University, School of Dental Medicine, 136 Harrison Ave., Boston
Southern Society of Orthodontists	Aug. 19-22	White Sulphur Springs, W.Va.	M. D. Edwards Secy.	132 Adams Ave., Montgomery, Ala.
Southwestern Society of Orthodontists	Oct. 7-10	Houston, Texas	H. S. Born Secy.	908 S. Johnstone Ave., Bartlesville, Okla.
Thirteenth German Dental Meeting	Aug. 20-26	Munich, Germany	F. H. Witt	Universitaetsstrasse 73, Cologne-Lindenthal, Germany
Thirty-first Italian Congress of Stomatology	Sept. 24-29	Florence, Italy	M. Bergamini	Via S. Gallo 25, Florence, Italy
Twelfth International Dental Congress	Sept. 7-14	Rome, Italy	P. Lalli Secy. Gen.	Via Boezio 16, Rome, Italy

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1. Am. Dent. Assoc.: Diet and Dental Health. 1954, p. 8.
2. Thomas, A. E.: Oral Surg., Oral Med. & Oral Path. 7:741-749, 1954.

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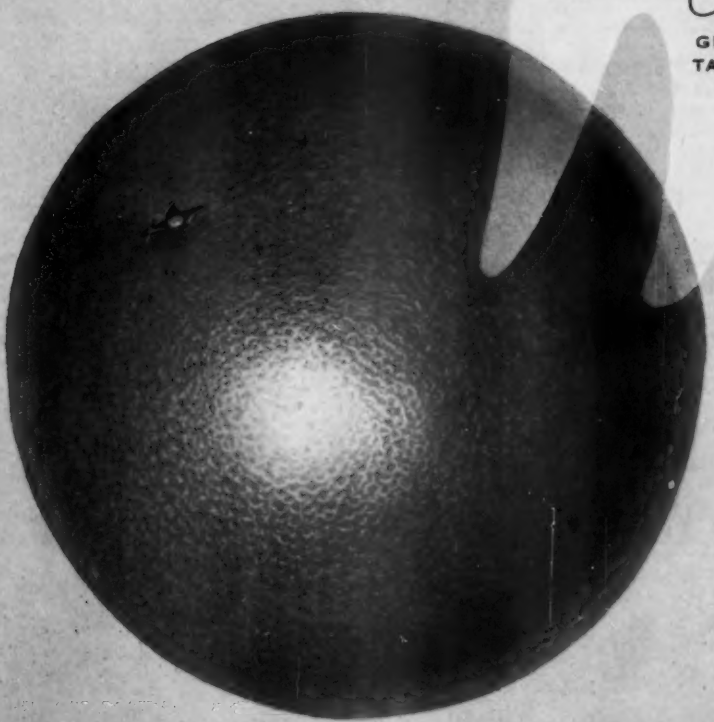

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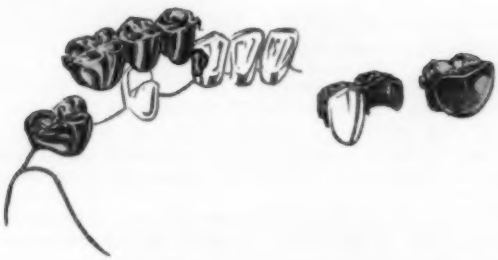

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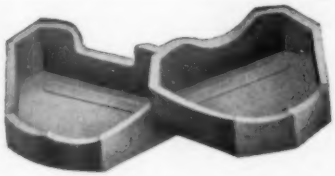

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Pour plaster or stone in former; mount anatomical cast and let set. Soft, flexible rubber permits easy removal; model comes out with perfectly-finished, symmetrical base.

Upper and lower models can be made in these formers to occlude automatically.

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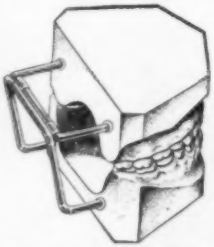
Study models show patients their mouths as you see them. Make study models regularly. You need them as you do X-Rays.



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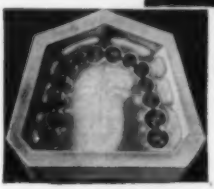

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The Spectrum of Nutrients in Oatmeal

The important contribution to daily nutritional health made by the broad spectrum of nutrients in the classical Quaker Oats breakfast dish is illustrated by this table. All the nutrients in oatmeal occur naturally.

THE QUAKER OATS BREAKFAST DISH*

NUTRIENTS	OATMEAL	MILK	TOTAL	NUTRIENTS	OATMEAL	MILK	TOTAL
†Protein	4.7 Gm.	3.9 Gm.	8.6 Gm.	†Iron	1.28 mg.	0.12 mg.	1.40 mg.
Carbohydrate	17.7 Gm.	5.7 Gm.	23.4 Gm.	†Calcium	15 mg.	148 mg.	163 mg.
Fat	2.0 Gm.	4.4 Gm.	6.4 Gm.	†Phosphorus	115 mg.	113 mg.	228 mg.
†Thiamine	0.18 mg.	0.05 mg.	0.23 mg.	Potassium	162 mg.	163 mg.	325 mg.
†Niacin	0.26 mg.	0.10 mg.	0.36 mg.	Zinc	1.08 mg.	0.45 mg.	1.53 mg.
†Riboflavin	0.05 mg.	0.19 mg.	0.24 mg.	†Folic acid	11.4 mcg.	0.3 mcg.	11.7 mcg.
†Pyridoxine	0.07 mg.	0.06 mg.	0.13 mg.	Vitamin B_{12}	0.1 mcg.	0.7 mcg.	0.8 mcg.
Pantothenic acid	0.25 mg.	0.41 mg.	0.66 mg.	†Copper	0.31 mg.	0.04 mg.	0.35 mg.
†Vitamin A plus Carotenoids	—	0.08 mg.	0.08 mg.	Manganese	1.45 mg.	0.002 mg.	1.45 mg.
Magnesium	51 mg.	14 mg.	65 mg.	†Calories	111	81	192

*1 oz. oatmeal (dry), 4 oz. whole milk; no sugar considered in this evaluation; sources supplied on request.

†Nutrients for which Daily Dietary Allowances are recommended by the National Research Council.

DENTAL AUTHORITIES stress the importance of optimal nutrition in the aim toward better dental health during the early growth years. Oatmeal, with its wealth of essential nutrients, not only contributes broadly to good nutrition, but—since its carbohydrate is not readily degraded to simple fermentable sugars—is of virtually no cariogenic influence.

Few foods can better the broad nutrient spectrum of the oatmeal serving. For its caloric content its nutritional contribution may well be unique, and justifies the continued recommendation of "an oatmeal breakfast" for every age, for the normal as well as the therapeutically indicated diet.

Quaker Oats and Mother's Oats, the two brands of oatmeal marketed by The Quaker Oats Company, are identical in their content of all nutrients. Both brands are available in the Quick (cooks in one minute) and the Old-Fashioned (cooks in five minutes) varieties.

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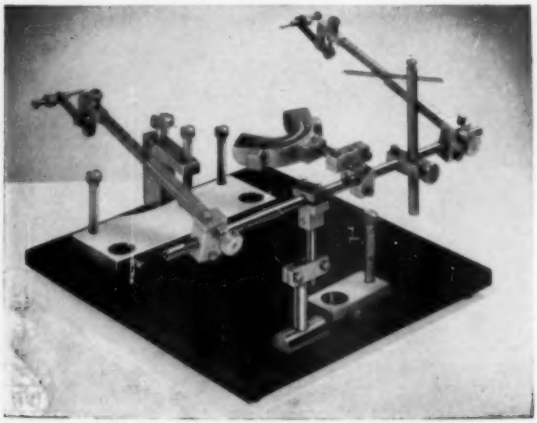
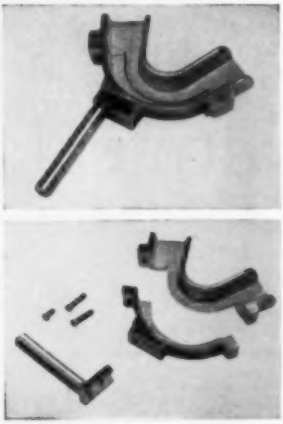
New Hanau Adjustable Hinge Axis Facebow introduces simplified method for accurate location of hinge axis and transfer to articulator



Adjustable Hinge Axis Facebow, Transfer Board and Clutch-Tray



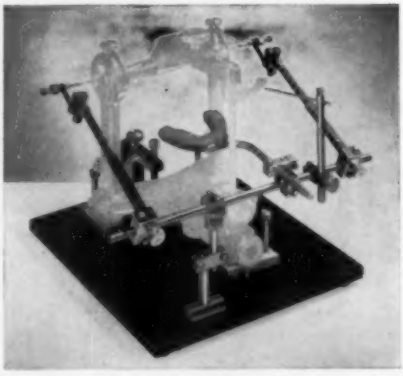
Clutch-Tray Assembled and Disassembled

Accurate determination of the hinge axis and exact transfer of the related cast to an articulator are now feasible in everyday, routine practice, with the introduction of The Adjustable Hinge Axis Facebow, Transfer Board, and allied instruments by Hanau Engineering Company.

With utmost precision and simplicity, this sturdy set of Hanau instruments enables pin-point location of the hinge axis without requiring unique skills and laborious procedures. By following a simple, step-by-step, illustrated technic (supplied), even the uninitiated can now determine the hinge axis accurately and quickly with the new facebow's fully mechanical, three-dimensional range of individual adjustments. Likewise, exact transfer of the maxillary cast to the Hanau Articulator S-M-X, by means of the new Transfer Board, has been reduced to simple, routine procedure.

The necessity for casting and preparing a clutch-tray for each patient, one of the most time-consuming and difficult steps formerly required, has been eliminated. Instead, Hanau has developed and supplies a sectional metal clutch-tray, complete with clutch and stem, that is adaptable to most lower arches.

Full details are available from Hanau Engineering Company, Inc., Buffalo 9, N. Y. and from leading dental suppliers everywhere.



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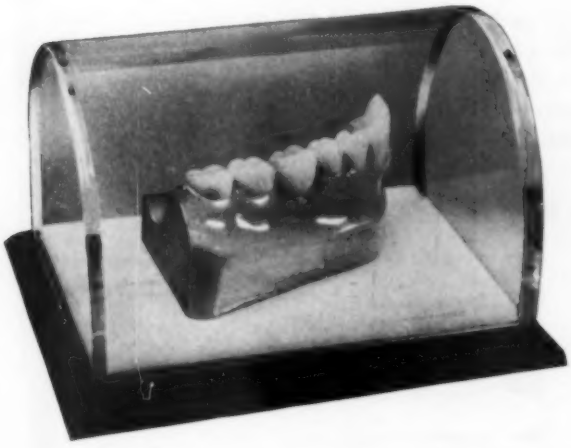

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Group A Acceptance announced J.A.D.A. 50:334 (Mar.) 1955

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A good diet is recognized as an important factor in dental health.[3] Enriched bread serves well in this regard, especially because its complex carbohydrate does not readily diffuse into bacterial plaques and therefore is of low cariogenic activity.[4]

1. Jolliffe, N.: Recent Advances in Nutrition of Public Health Significance, Metabolism *4*:191 (May) 1955.
2. Sherman, H. C.: Chemistry of Food and Nutrition, ed. 8, New York, The Macmillan Company, 1952, pp. 212, 598, 599.
3. Committee on Dental Health, Food and Nutrition Board: Control of Tooth Decay, Washington, D. C., National Academy of Sciences—National Research Council, 1953.
4. Joint Report of the Council on Dental Health and the Council on Dental Therapeutics of the American Dental Association: Sugar and Dental Caries: The Effect on the Teeth of Sweetened Beverages and Other Sugar-Containing Substances, J. Am. Dent. A. *47*:387 (Oct.) 1953.

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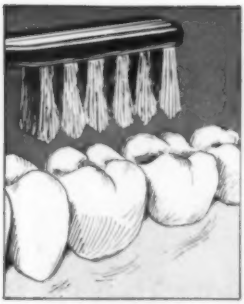

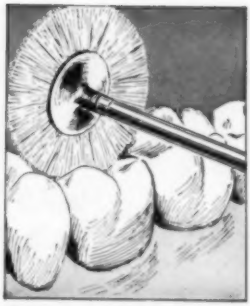

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*JADA Vol. 47, P. 324-329, Sept. 1953. NELSEN, R. J., D.D.S.; PELANDER, C. E.; KUMPULA, J. W.: Hydraulic Turbine Contra Angle Handpiece. (Reprint on request)

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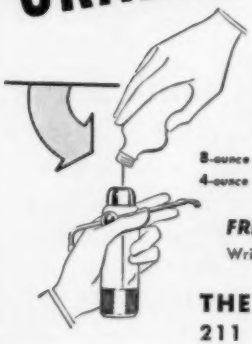

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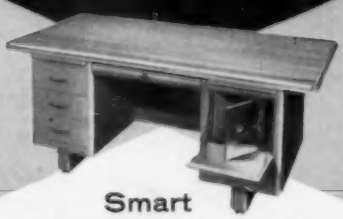

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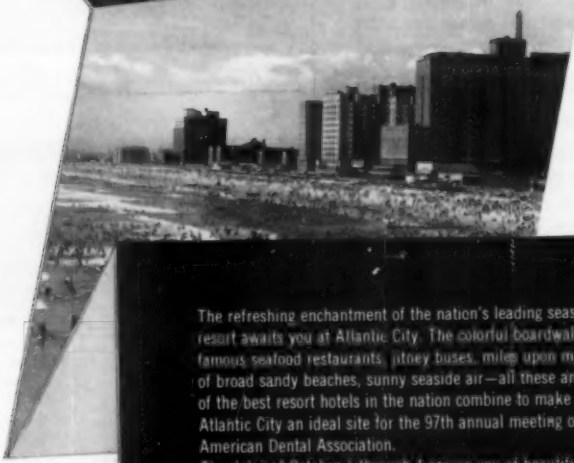

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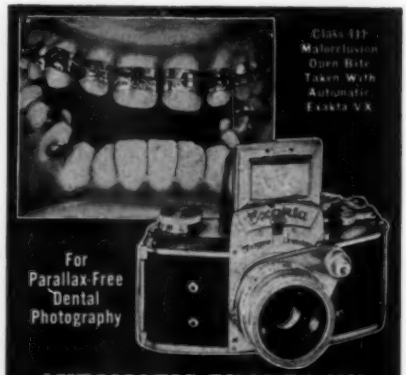

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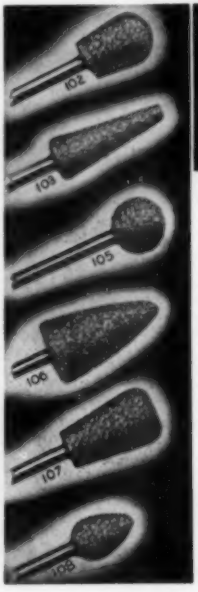

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COLORADO—For sale. Long established lucrative practice. Modern, fully equipped, ground floor office. Low overhead. Ideally located near east central Colorado. Booming county seat town, about 5,000. Colleges near. Three-bedroom home optional. Available about June. Address A.D.A. Box No. 264.

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COLORADO—For sale. Active practice in growing college town. Fully equipped two-chair office. Street floor location. Will sell for inventory, about $3,500. May arrange terms. Address A.D.A. Box No. 235.

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ILLINOIS—For sale. Fully equipped two-chair office and active, well established practice. Excellent income. Air-conditioned, 3-room suite. In building with three physicians. Building and practice 6 years old. Will stay to introduce. Leaving state. Telephone SKyline 5-1333. Ezio Grossi, 39 E. McEldowney, Chicago Heights, Ill.

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ILLINOIS—For sale. One chair dental equipment perfect for recent graduate or experienced dentist. Owner deceased. Will sacrifice. If interested write or call Mrs. Borg, 1211 Harvard Terrace, Evanston, Ill. Phone University 4-4343.

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ILLINOIS—For rent. Two-room suite of offices and dark room for dentist in new modern medical building. 8146 North Milwaukee Ave. Phone Niles 7-8400, Northwest Medical Center of Niles.

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MARYLAND—Baltimore. For sale. Busy established general practice in residential district. Modern office with two very attractive and fully equipped operating rooms, all on ground floor. Adjacent to ethical commercial laboratory. Reasonable rent. Owner entering service. Address A.D.A. Box No. 313.

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MICHIGAN—For rent. New dental office with two operating rooms, laboratory, dark room, private office, lavatory, receptionist vestibule. Situated in industrial area, with off-street parking and air-conditioning. No other dentist in the area. Write or telephone Dr. C. W. Nelson, 551 E. Michigan Ave., Battle Creek.

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MINNESOTA—For sale. Well established varied general practice and modern two-chair, air-conditioned dental office at inventory. High caliber dentist assured $10,000 net first year. Am leaving to specialize. Address A.D.A. Box No. 316.

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MINNESOTA—For sale. Two-chair office in the heart of lake area, ground floor, seven rooms. Good fishing, and golfing. Large net income. Available now. 97% collections. Dr. V. E. Shuckhart, Medical Arts Bldg., Park Rapids, Minn.

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MISSOURI—For sale. Modern, fully equipped dental office, excellent location, nice practice. Dr. William J. Allen, 724 Maud St., Poplar Bluff, Mo. Phone 2160.

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NEW JERSEY—For sale or rent. Eight room home—office combination with established active general practice in north Jersey, Bergen County. Excellent professional location in prosperous New York suburb. Address A.D.A. Box No. 332.

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NEW JERSEY—For sale. Well established 30 year general practice, two-chair office and equipment. Located in seashore city near New York. Retiring because of health. Address A.D.A. Box No. 246.

NEW YORK—Scarsdale. Ideal location corner ½ acre. Colonial 8 rooms, 1½ baths. Oil hot water, parking, low taxes, large terrace, two car garage, also smaller building (15 x 30) easily convertible to office. Close to schools and churches. Main thoroughfare. Fine neighborhood. Mrs. Jane Hoffman, 187 Woodruff Avenue, Scarsdale, N. Y.

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NEW YORK—For sale. Active practice, fully equipped, large corner property in busy rapidly growing central New York metropolitan area. Excellent opportunity for enterprising man. Terms reasonable. Reason for selling—other interests. Address A.D.A. Box No. 325.

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NORTH DAKOTA—For sale, established practice in eastern area of state. Two beautiful operating rooms with modern equipment. Splendid opportunity for young man wishing to move to larger community with many advantages. Financing available. Address A.D.A. Box No. 308.

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OHIO—For sale. Very reasonable. Only dentist in prosperous, growing south central Ohio town serving 9,500 people. 1953 S. S. White equipment, one operating room, laboratory, dark room, central air conditioning, blacktop parking lot, 1953 building, space designed for second operating room, well established, long recall list, gross very easily of $26,000. Beautiful six-room home available nearby. Owner leaving because of illness in family. Address A.D.A. Box No. 284.

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PENNSYLVANIA—For sale. Two-chair Ritter equipped office space and practice in central Pennsylvania. Established 15 years. Good clientele and fees accordingly. Owner leaving to specialize. Occupancy July or August 1956. Address A.D.A. Box No. 317.

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PENNSYLVANIA—Eastern Pennsylvania, long established dental office in excellent location, 3 rooms, dark room, lavatory, furnished waiting room shared with M.D., wiring and plumbing in place. Address A.D.A. Box No. 288.

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PENNSYLVANIA—For sale or rent. Fully equipped two-chair dental offices, long established practice. Owner deceased. Write Mrs. John J. Ross, 106 Market St., Summit Hill.

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SOUTH CAROLINA—For sale. Modern, fully equipped office. Excellent location in fast growing progressive city of Greenville. Owner wishes to leave state. Address A.D.A. Box No. 252.

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VIRGINIA—Arlington. For sale. Well established general practice and equipment in choice community, population 150,000. Office and home combined with rental possibilities. Entering military service. Address A.D.A. Box No. 329.

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VERMONT—For sale. Established dental practice. Beautiful northeastern community, exceptional educational facilities, year-round recreational activities, lovely lakes, nearby skiing areas. Perfect TV reception and nearby airline service. Reason: retirement. Now showing substantial yearly income; valuable real estate with modern equipment, reasonable terms granted. Harold Stuart, 140 Boylston St., Boston, Mass.

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WEST VIRGINIA—Practice for sale, exodontics and oral surgery. Modern office, four operating rooms, town population 85,000, drawing area twice that. Average gross past five years $90,000. Owner leaving town. Address A.D.A. Box No. 277.

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WYOMING—Laramie. Two-chair fully equipped general practice dental office, downtown building with elevator, new Ritter unit, almost new x-ray unit, all instruments, supplies. Dentist deceased March 1. Widow will sell for $6,000. Dentist shortage in University town excellent hunting and fishing. John R. Bunch, M.D. for details. 1303 Grand, Laramie.

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CALIFORNIA—Wanted. Dentist for mountain community, northern California. Main industries lumbering and agriculture. Area offers outdoor life, fishing, hunting, camping and winter sports. Contact Mrs. S. Sims, Box 704, Quincy, Calif.

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MISSOURI—Dentist, general practice, in town of 400 population, in rich farming area of Lafayette and Saline County. Office space available. Equipment of deceased dentist may be purchased cheap. Potential drawing area of 15 miles square including two neighboring towns. Address A.D.A. Box No. 309.

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NEW YORK—Dental opportunity. Former physician's residence, center of beautiful upstate village of 1,400, main highway. Dentist needed. Ideal office space, six rooms and bath on first floor, six-room upstairs apartment now rented. All modernized. Two-car garage. Reasonable price and terms. Robert E. Atkinson, Unadilla, N. Y.

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NORTH DAKOTA—Dentist required for Hope and vicinity. Office space available in new clinic building. Write Hope Clinic Board, Hope, N. D.

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CONNECTICUT—Wanted. Capable associate for excellent practice in most rapidly expanding town in Connecticut. Associate to assume major responsibilities of practice with commensurate income and/or opportunity to purchase. Illness forces owner's early retirement. Address A.D.A. Box No. 331.

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FLORIDA—General practice. Associate needed in thriving lower east coast practice. Wonderful opportunity for well trained Florida licensee. Please state full details as to qualifications and background. Address A.D.A. Box No. 313.

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ILLINOIS—Wanted. Dentist interested in pedodontics. Hours 9:00 to 4:00, five day week. Retirement benefits. Children's dentistry exclusively. Salary open depending upon qualifications. Telephone Dr. Nicholas Frankovelgia for appointment. Stickney Health Dept., 6721 W. 40th St., Berwyn P.O., Ill. Phone Stanley 8-9100.

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NEW YORK—Opportunity for dentist with medical group practice in upstate New York. Must have New York state license. This group, offering comprehensive medical care, has three dentists, one vacancy at present. Semi-rural area. 120 miles from New York City. Salary commensurate with training and experience. Excellent opportunity for dentist interested in integrated medical practice, preventive medicine and rural living. Address A.D.A. Box No. 303.

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OHIO—Wanted, young dentist who needs help in establishing permanent practice. Have four-chair office. Will sell interest reasonably after short time. Salary. Wonderful opportunity. Address A.D.A. Box No. 328.

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OHIO—Associate wanted for extensive well established practice. Please give detailed qualifications. Address A.D.A. Box No. 312.

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COLORADO—Hygienist wanted for small new medical-dental building to be completed in July 1956. Well established practice in fine area of Denver. Pleasant working conditions. George T. Rivis, D.D.S., 3920 Tennyson St., Denver.

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Oral surgeon, married, 1947 graduate, service completed, over four years, hospital training including general anesthesia; national; Connecticut, New York, Massachusetts boards, desires association with oral surgeon or group. Address A.D.A. Box No. 298.

•

Oral surgeon, B.S., D.D.S., M.S.—licensed in New York, New Jersey and Pennsylvania, eight years' experience, efficient knowledge of inhalation, intravenous anesthesia, will conduct practice or accept position with an accredited oral surgeon for the months of June, July, and August. Address A.D.A. Box No. 305.

Northwestern University graduate, age 25, licensed in Colorado and Florida, completing military obligation in August, desires association with established general practitioner. Partnership with eventual purchase of practice desired. Address A.D.A. Box No. 306.

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Young, well-trained dentist, Columbia graduate with internship experience is looking for lucrative position or association with older dentist in New York metropolitan area. Address A.D.A. Box No. 326.

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Dentist; Illinois license, 1954 graduate completing military service in July, desires practice in Illinois. Also interested in association. Prefer northern Illinois. Address A.D.A. Box No. 322.

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Dentist, desires association with active general practitioner in Miami, Florida area, with view to purchasing, or taking over practice. Have own equipment. No reasonable offer refused. Address A.D.A. Box No. 324.

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Pennsylvania licensed dentist, 1954 graduate, completing military service in August 1956. Interested in purchase or association to purchase general practice in medium size city or suburban community. Address A.D.A. Box No. 323.

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Dentist available, licensed in Illinois and Wisconsin, wide experience and capable, surgical background, three oral surgery internships and master's degree. General or surgical practice. Will consider association or same with option to eventually purchase. Address A.D.A. Box No. 327.

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Orthodontist. Desires location, association or purchase of orthodontic practice. University trained. Using edgewise appliance. Teaching experience. Military requirements completed. Willing to take necessary boards. Address A.D.A. Box No. 318.

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Michigan licensed dentist, 1953 graduate, general service internship, completing military service in July 1956, desires location for general practice in southeastern Michigan. Address A.D.A. Box No. 333.

General dentistry or hold M.S.D. for oral surgery. Also graduate work in public health dentistry. Ten years Navy Dental Corps, 6 years institutional and industrial dentistry, 4 years private practice. Age 47. Consider foreign opportunity. Have National Board certificate. Address A.D.A. Box No. 310.

•

Oral surgeon, New York licensed, available June 1956 desires association with established oral surgeon or group. Internship residency, approved by A.D.A. and two years as oral surgeon in army hospital. Will take boards. Address A.D.A. Box No. 311.

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Dentist, Pennsylvania licensed, general practitioner, draft exempt, desires association with possible purchase or to purchase office, complete, in Pittsburgh, Philadelphia or Bucks County. All replies confidential, give full details. Address A.D.A. Box No. 319.

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Wanted: Association or other opportunity in Oregon. Married, military obligation completed including rotating internship. Will take June boards. Address A.D.A. Box No. 320.

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Young dentist leaving service desires part-time association in Boston area for one year while doing post-graduate work. Available full time July 15 to September 15. Thereafter, afternoons, evenings and Saturdays. Address A.D.A. Box No. 336.

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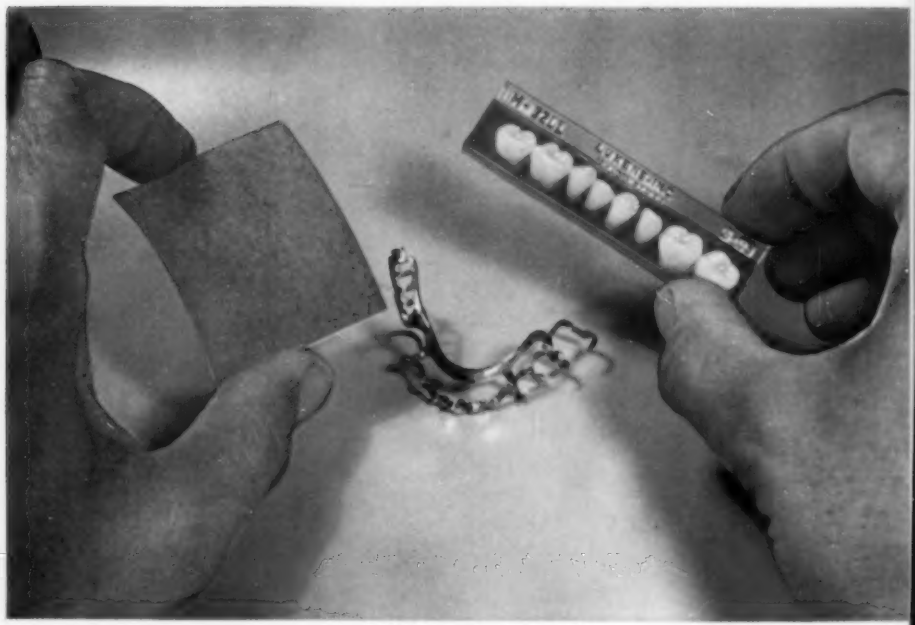

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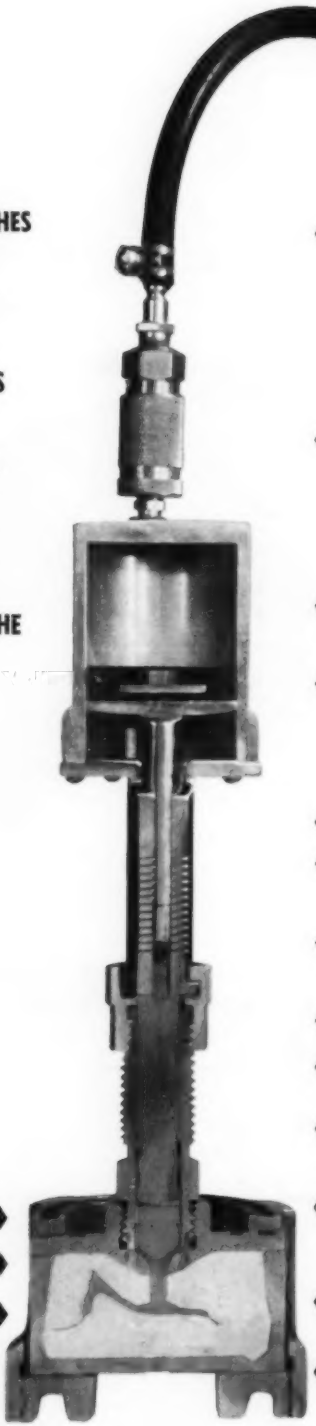

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Air gun cylinder.

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Air gun guide indicates amount injecte

Hole in piston enables operator to remo the piston by slipping metal rod throu the hole and pulling it up. This is nec sary for recharging.

Air gun adapter.

Piston.

Nozzle threaded to screw into air g adapter.

Lid and bottom surface perfectly flat so as to close uniformly.

Sprue button.

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Flask splits here. Notice how perfectly closed — metal to metal contact.

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Bottom ring of the "cage" which, wh tightened in cage closer, closes the flo perfectly.

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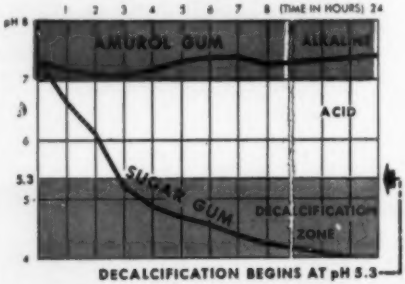

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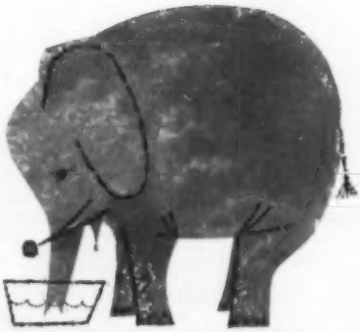

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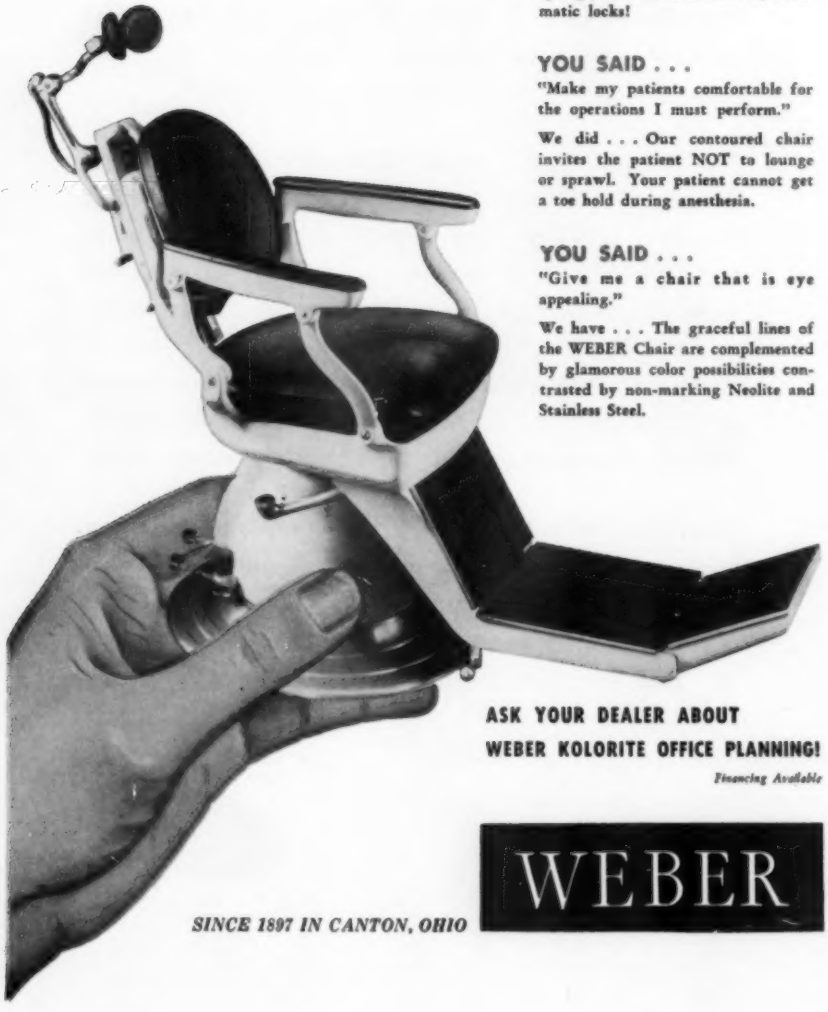

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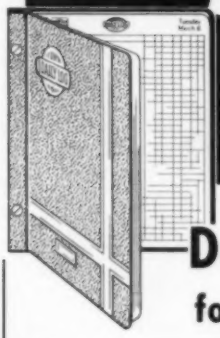

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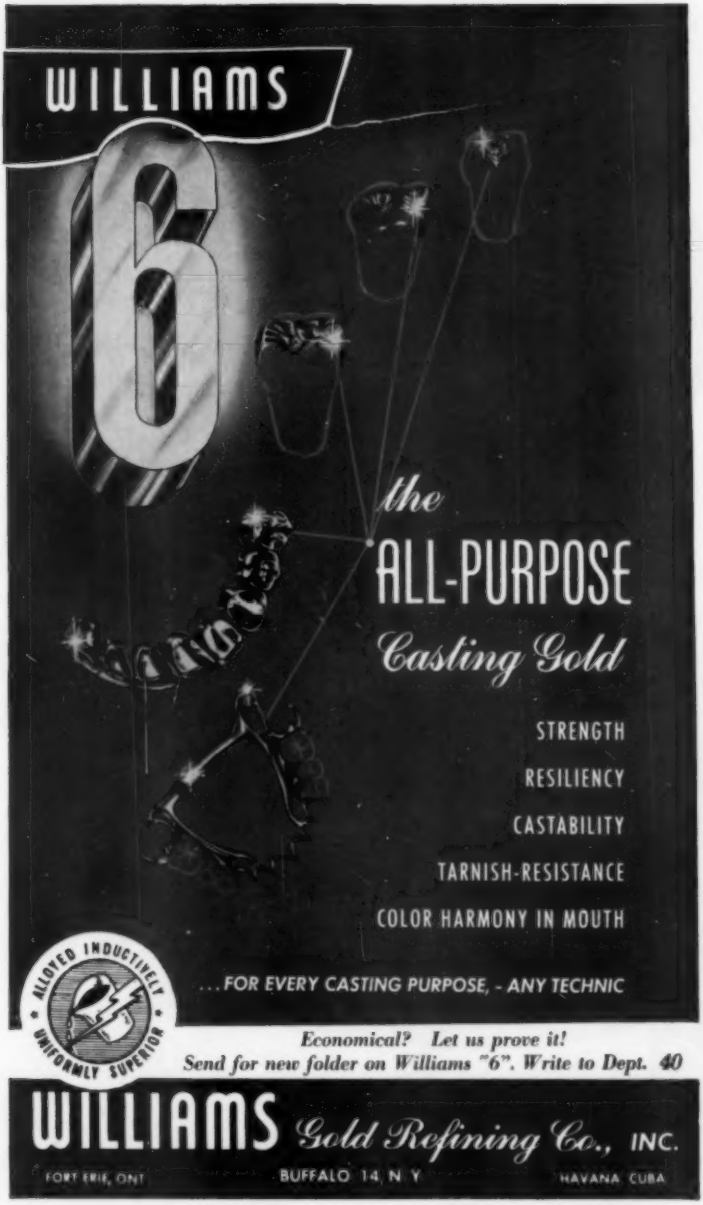
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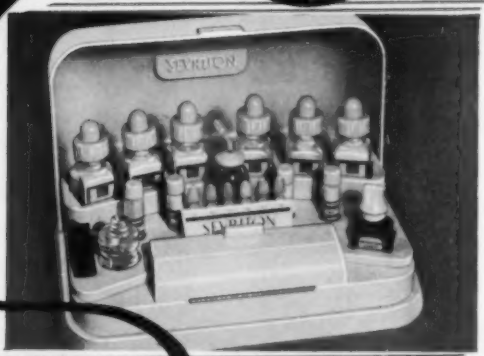

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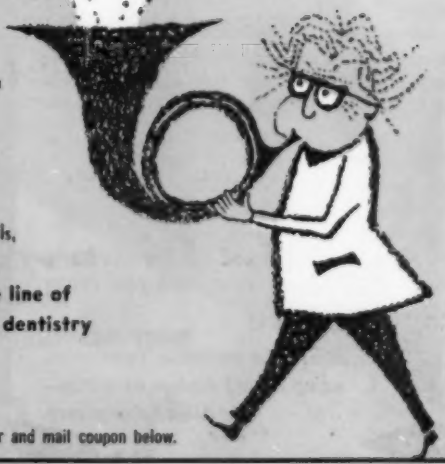

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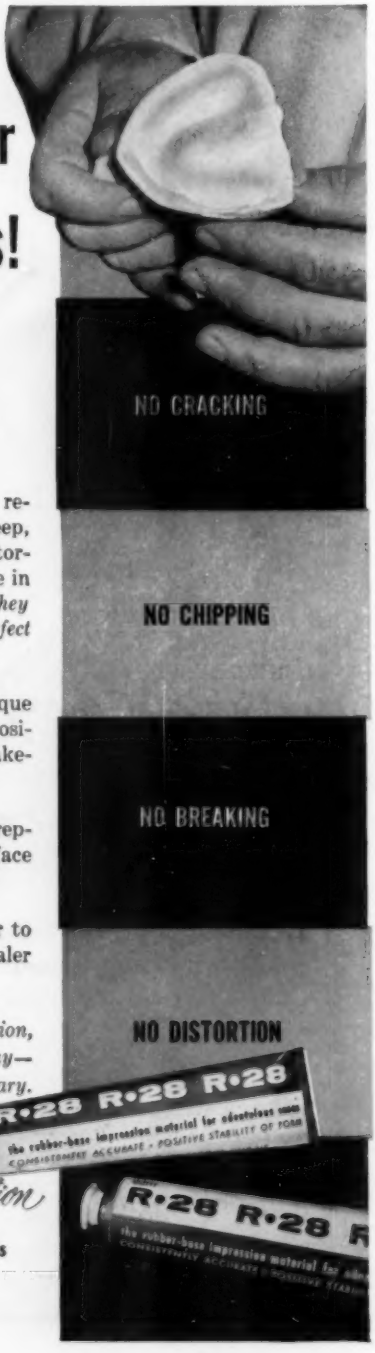

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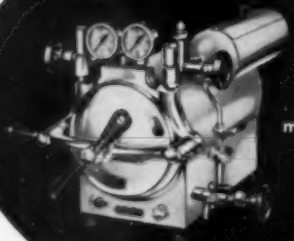

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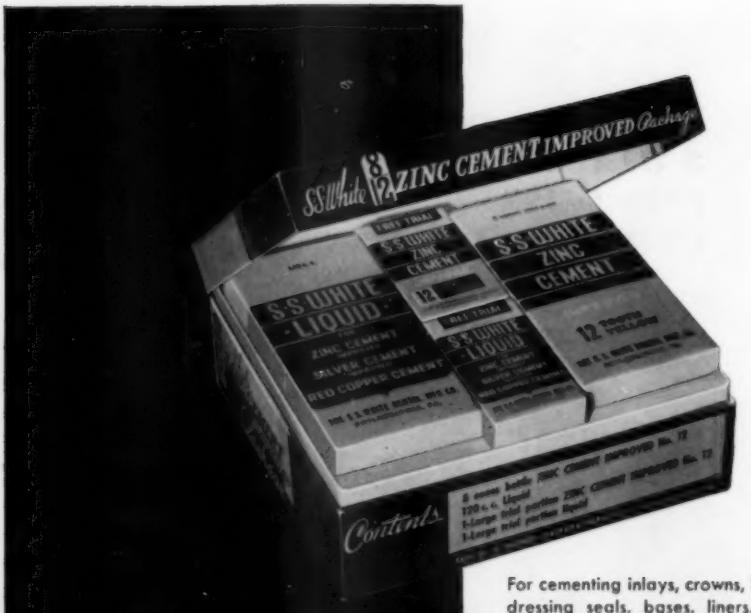

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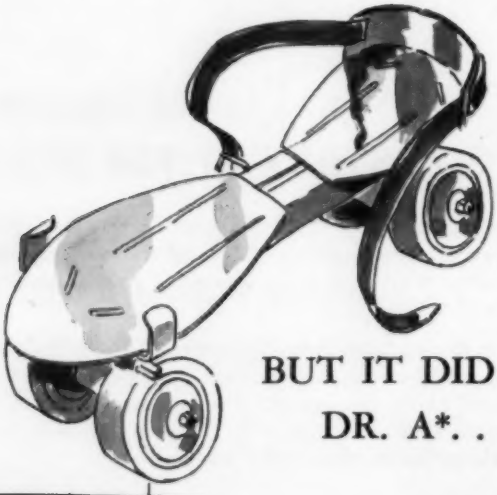

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Be sure to indicate your arrival time in Atlantic City. Reservations will be held only until 6 p.m. of the day you indicate when you will arrive in Atlantic City unless special arrangements are made with the hotel.

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☐ Suite of_____ rooms, including parlor, rate to range from $_____ to $_____ per day.

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25	Madison	6.00–12.00	7.00–14.00	
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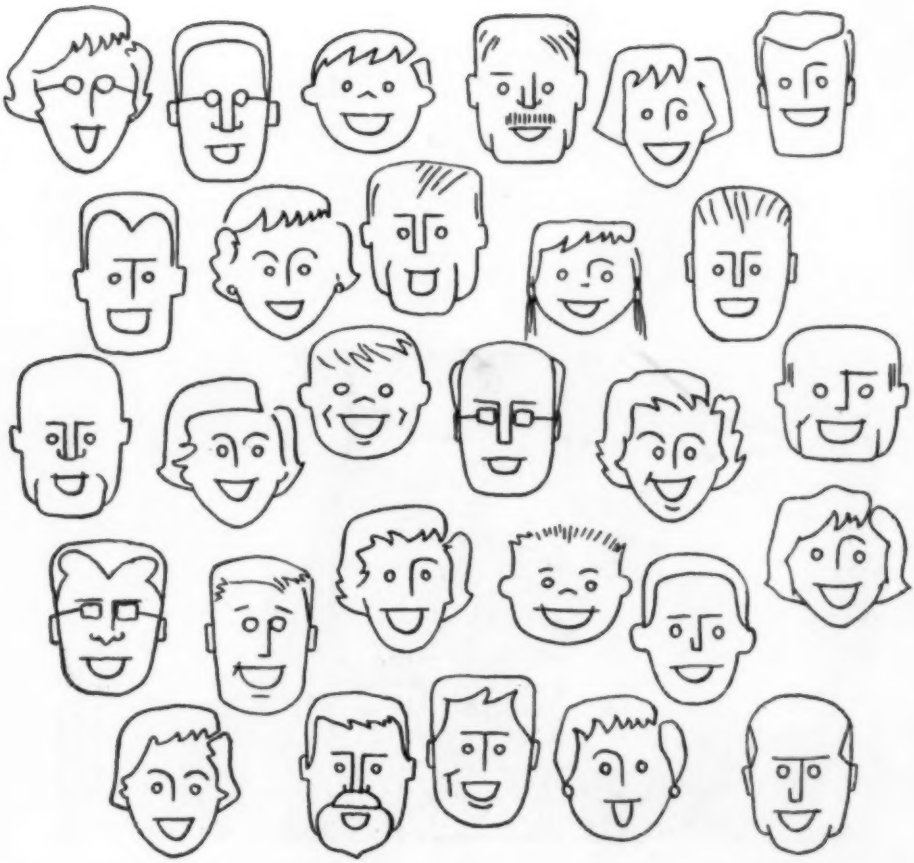

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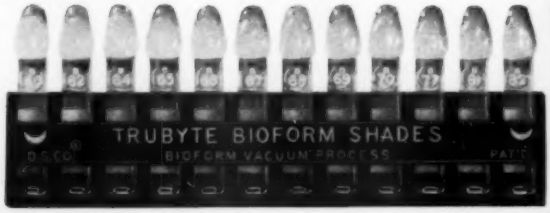

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